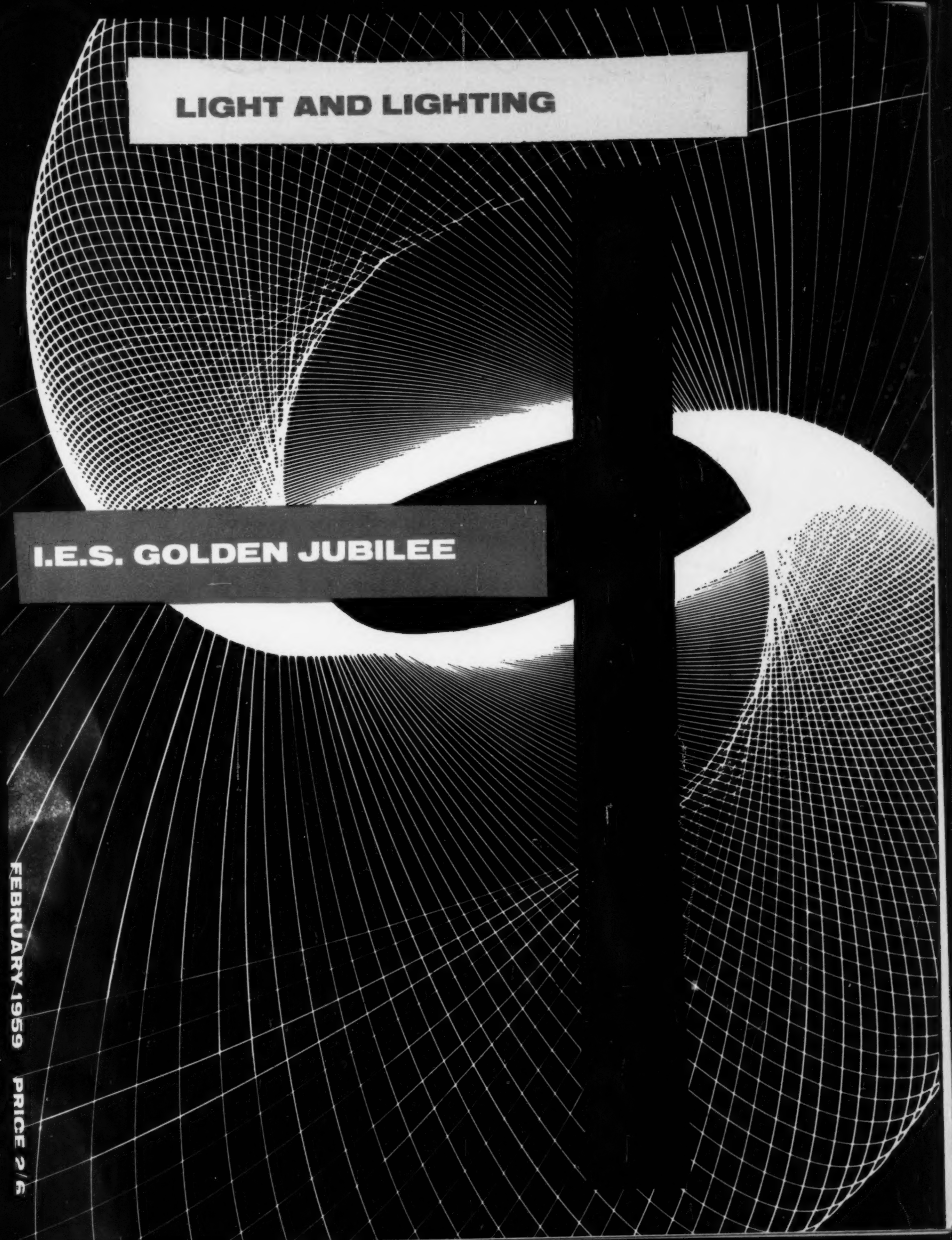
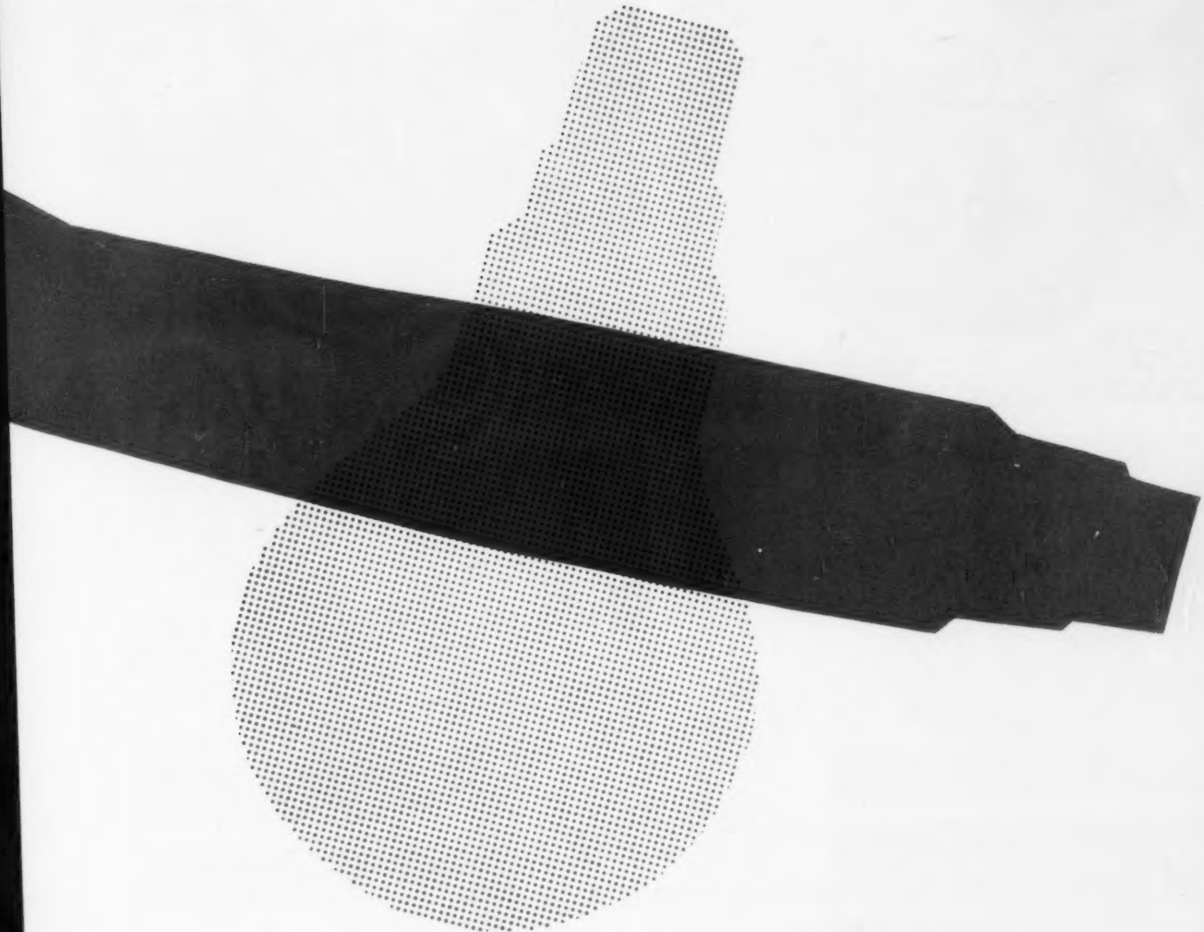
LIGHT AND LIGHTING



I.E.S. GOLDEN JUBILEE

FEBRUARY 1959 PRICE 2/6



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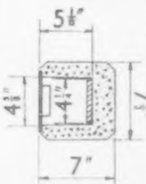

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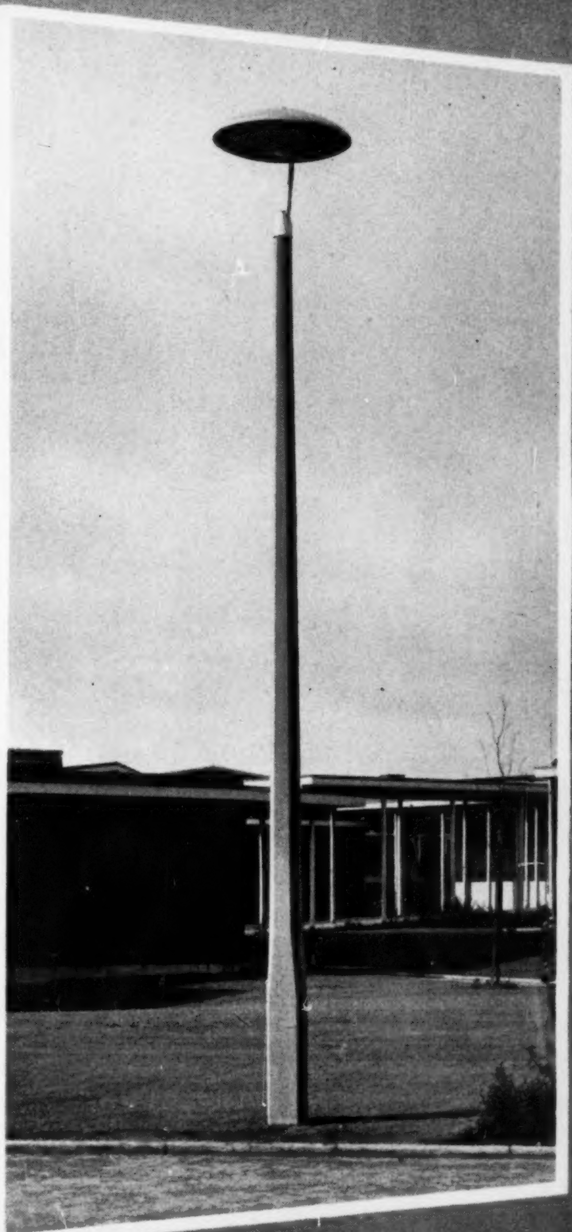

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CLEARING

Photograph by courtesy of Ford Motor Company Ltd

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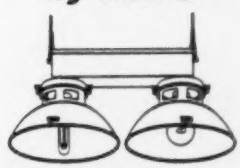

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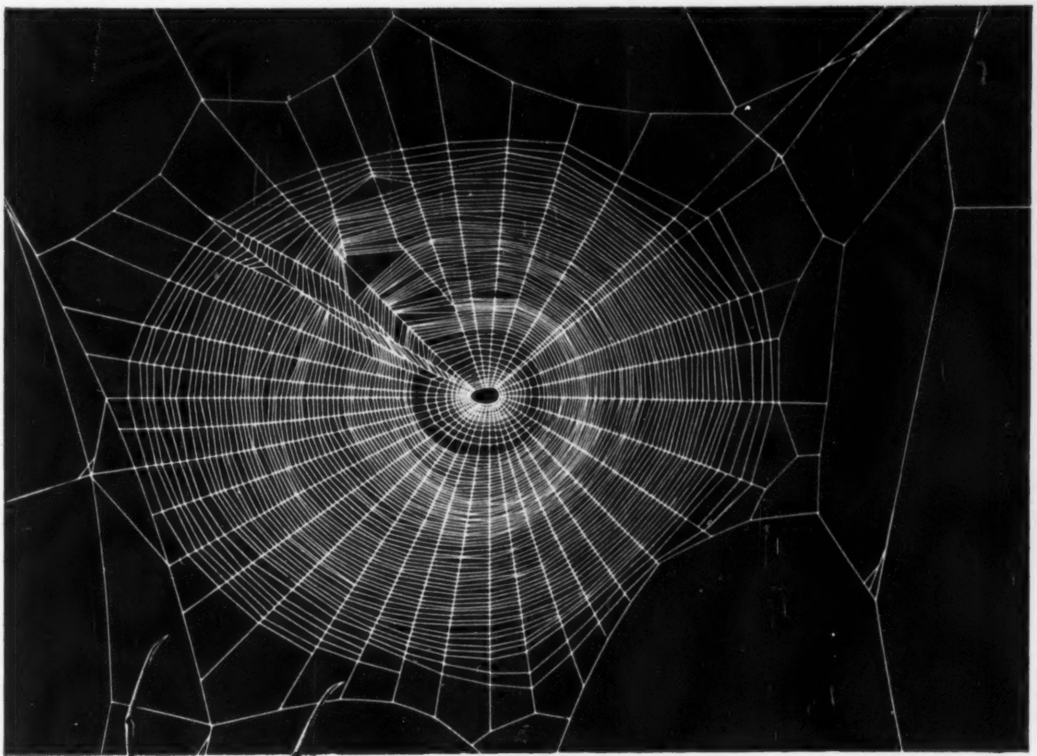

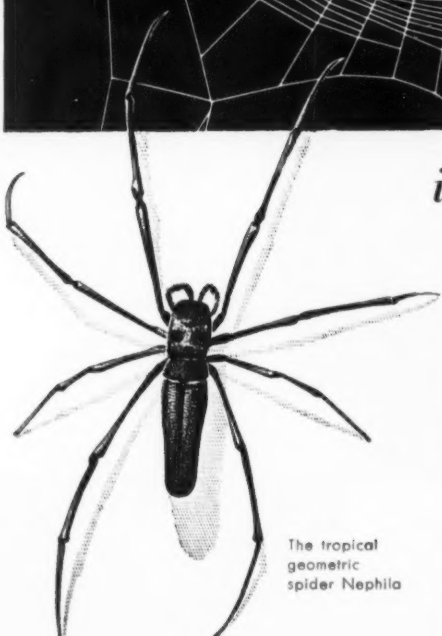

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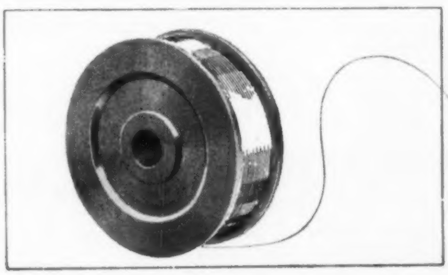

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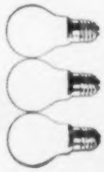

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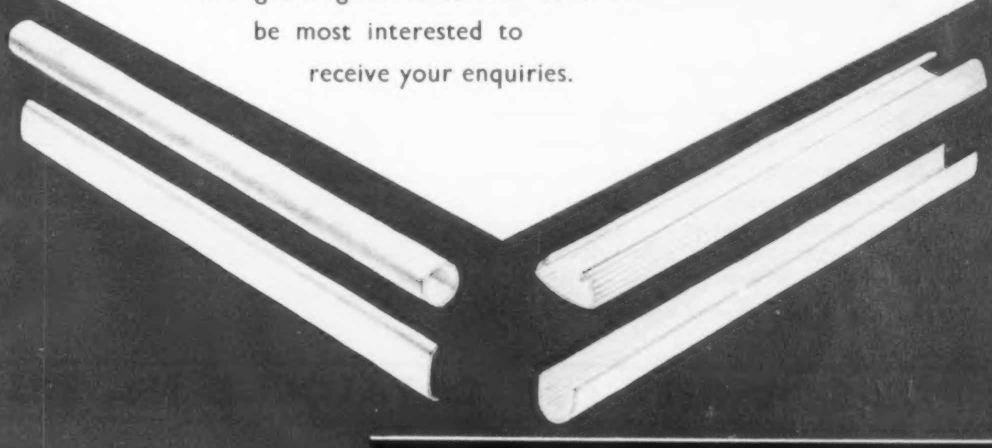

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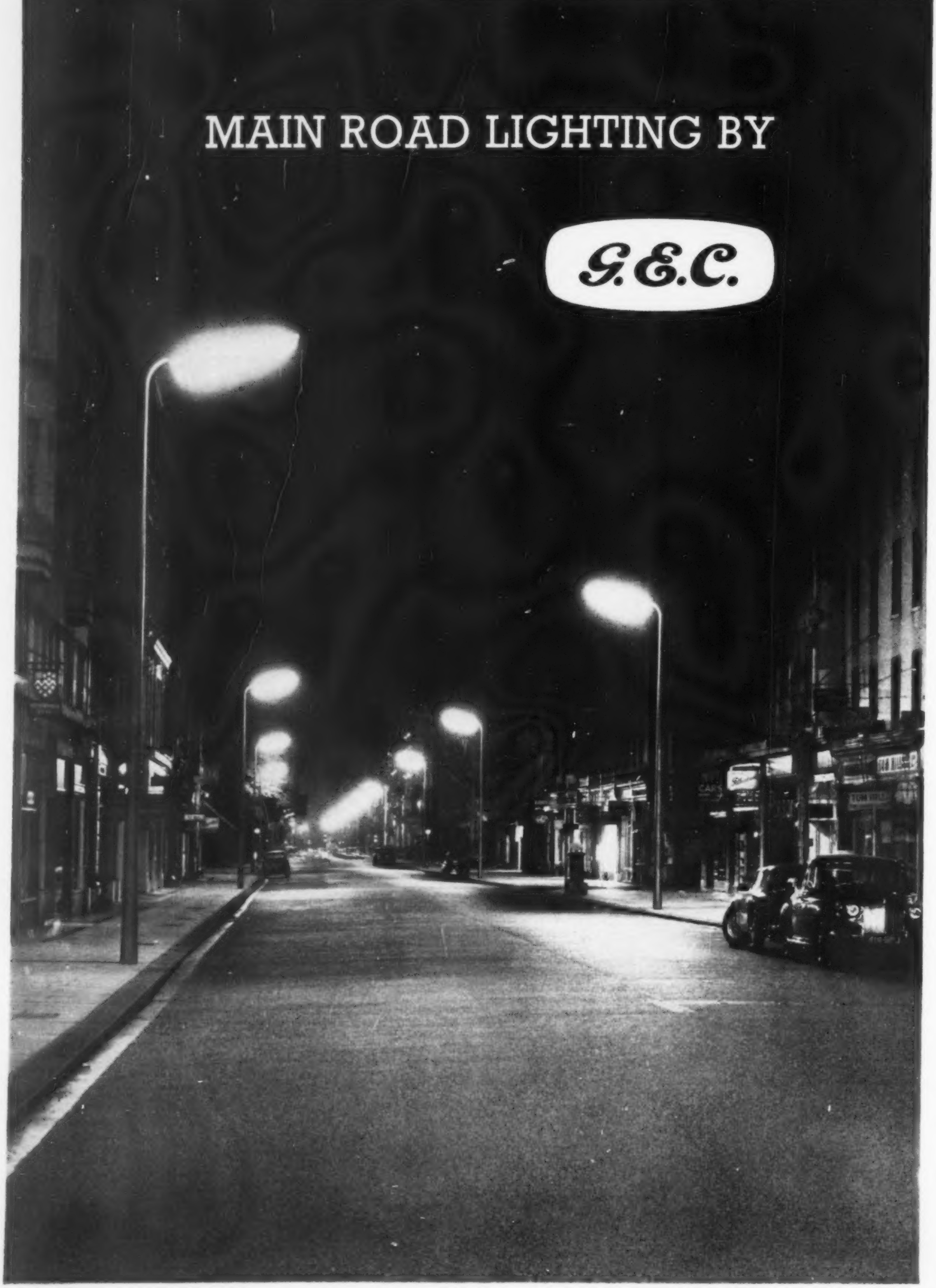
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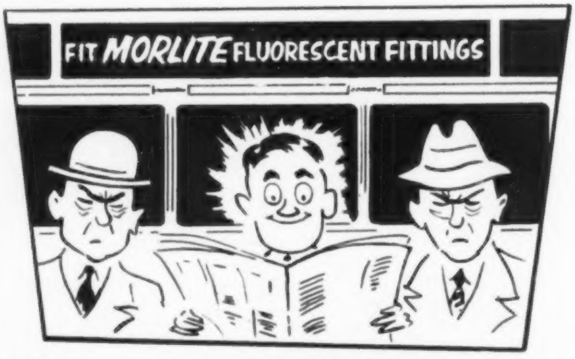

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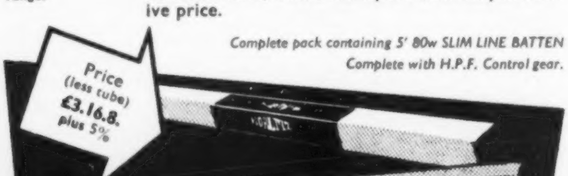

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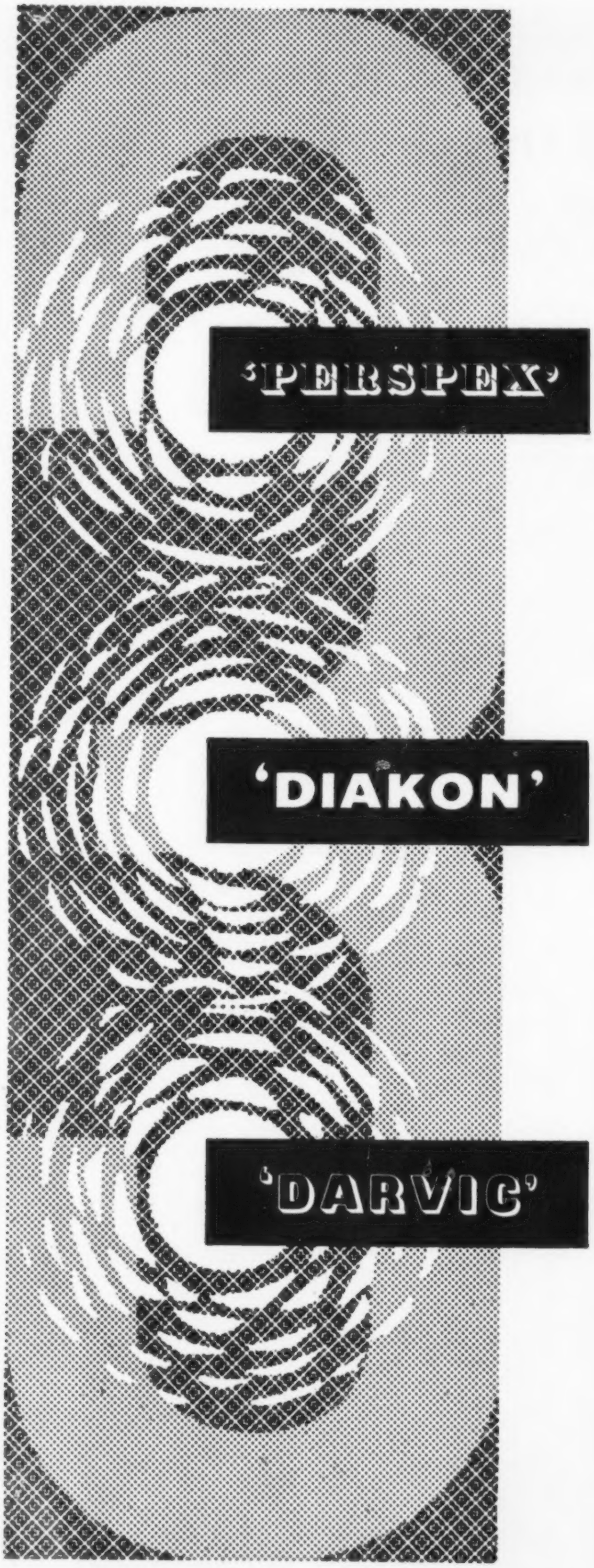

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ILLUMINATING ENGINEERING SOCIETY 1909/1959

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Congratulations to the Illuminating Engineering Society on their Golden Jubilee

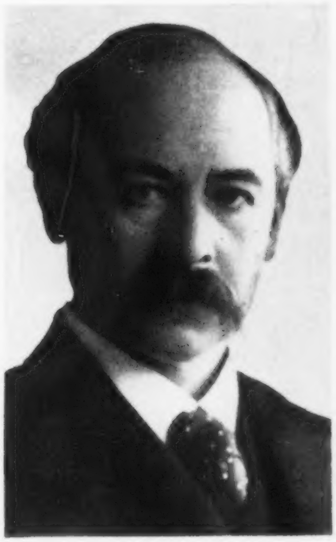
Vol. 52. No. 2. February, 1959

Light and LIGHTING

Published by The Illuminating Engineering Publishing Co. Ltd. on the 1st of each month at 32, Victoria Street, London, S.W.1.
Telephone: ABBey 7553. Subscription rate 30s. per annum.

I.E.S. GOLDEN JUBILEE

A special issue of 'Light and Lighting' devoted to a history of the first fifty years of the Illuminating Engineering Society.



Left : Prof. S. P. Thompson
First President 1909-14

Right : Leon Gaster
First Hon. Secretary 1909-28

During the 50 years that The Illuminating Engineering Society has been in existence many changes have taken place. Some say that we are now in the " jet age "—symbolised by the above picture of " Comet " aircraft at London Airport. In modern usage the term " age " seems to have but fleeting significance and already we talk of the " space age ". So much has happened in 50 years; progress promises to be even more rapid in the next 50 years. Perhaps the time will come when an artificial " sun " will provide our light at night. Until then both lighting as we know it and the IES have a service to give and will continue to give it.

I.E.S. GOLDEN JUBILEE

The first fifty years

AMONG the interesting events of the year 1909 was the foundation of the Illuminating Engineering Society. There were, of course, other notable events—the discovery of the North Pole, the first crossing of the English Channel by aeroplane, the introduction of Lloyd George's "People's Budget," the establishment of Labour Exchanges and so on. Historians may rank these diverse events in order of significance if they please, and by criteria of their own choosing. But, for the interests which this journal serves and represents, *the* event of 1909 was the birth of the IES. The longevity of societies is not to be measured in terms of the span of human lives and now, on the completion of its fiftieth year, the IES is not middle-aged; it is still a lusty youngster needing only continued sustenance and virility to go forward into its second half-century growing the while both in usefulness and prestige.

It is difficult to imagine that the science, art and practice of lighting would have advanced to its present position if it had not been fostered by a society of its very own. The small band of enthusiasts who met together one February night 50 years ago and resolved to found the society obviously believed that such a society could exercise functions which no corporate body then in existence was adapted to discharge. They were right. And it must be gratifying to the very few founder members who, happily, are still with us to know how fully their faith has been vindicated and how strong is their "brain-child" at its Golden Jubilee.

Lighting, as a subject, is not one for the engineer alone, but for the physicist, the chemist, the physiologist, the psychologist, the oculist, the architect, the artist, and, indeed, for everyone who has eyes to see. That is why the IES has always been a cultural society—not exclusively a professional organisation nor a "learned society." Throughout its life it has been effective, directly and indirectly, in establishing and promulgating the principles of good lighting and promoting its use in the U.K. But its influence has been international, and its standing among similar societies in other countries is second to none.

A BRIEF HISTORY OF THE SOCIETY

From foundation to 'coming of age'

The Illuminating Engineering Society is celebrating this year the fiftieth anniversary of its foundation. What were the circumstances which, just half a century ago, led a group of far-sighted men with widely divergent interests to form the society whose growth and work are recorded in this issue of *Light and Lighting*? The first illuminating engineer was an Englishman—that extraordinary man of genius and adventure, Benjamin Thompson, Count Rumford, perhaps best known for his work on the mechanical theory of heat and as the founder of the Royal Institution in London. His book "On the Management of Light in Illumination," which was published in 1812, laid down guiding principles for the lighting engineer and described fittings used in putting them into practice.

RUMFORD'S illuminant was the oil-burning Argand lamp, and this was only gradually superseded by gas during the first half of the 19th century. The year 1855 saw the introduction of the electric arc lamp, and in the closing years of the century progress was rapid due to the invention, first of the carbon filament lamp (1879) and then of the Welsbach mantle (about 1890). It was not, however, until the advent of the metal filament lamp, with its still greater efficiency, that the design of a lighting system, and not just an array of lamps, became economically practicable.

Prominent among the pioneers in this field was A. P. Trotter, whose paper read before the Institution of Civil Engineers in 1892 and entitled " The Distribution and Measurement of Illumination ", may be said to mark the birth of modern illuminating engineering in this country. Interest in the subject grew, but it was slow, and the next landmark was a paper read to the Association of Engineers-in-Charge (now the Association of Supervising Electrical Engineers) by Leon Gaster in 1907. In this paper the author sketched what he called " The Province of the Illuminating Engineer " and he followed it quickly by founding in January, 1908, the journal now known as *Light and Lighting*, but then and until 1935 called *The Illuminating Engineer*. It is worth noting in passing that the first issue recorded the death of Lord Kelvin, while a few months later there appeared a description of some of the festive lighting at the Franco-British Exhibition, the first of the series held at the White City.

The final impetus toward the formation of The Illuminating Engineering Society was given, again by Gaster, about a year later. On February 9, 1909, he brought together at an informal dinner, held in the Criterion Restaurant, a number of people interested in lighting from different points of view. Several gas and electrical engineers, an architect and an eminent ophthalmologist were among the twenty-six present on that occasion. At the close of the dinner Gaster put before them his views on the need for a British illuminating engineering society (the American society had been formed in 1907) and the useful work it might do for the community. Among those who spoke in favour of the scheme were J. H. Parsons (later Sir John Parsons), J. Darch, Haydn T. Harrison, K. Edgcumbe (now Lord Mount Edgcumbe) and J. S. Dow, who on this occasion made his classical remark that when he looked up " illumination " in a well-known encyclopaedia he was rewarded with the cryptic reference: " Illumination: *see* Fireworks."

The date of this dinner has generally been regarded as the birthday of the IES, but in fact all that was done on that occasion was to decide that such a society should be formed and the task of working out a definite constitution was entrusted to a committee of seven, with Parsons as chairman and Gaster acting as secretary.

The committee speedily got to work and by May it was ready to call together a meeting of people interested in the project and to put before them a set of draft statutes and by-laws. The meeting was held at the St. Bride Foundation Institute, off Fleet Street, on May 25, and on the motion of Trotter, seconded by Edgcumbe, the proposed constitution was adopted and the IES was born.

Sir John H. Parsons
President 1921-24

There are one or two points worth noting about the first constitution of the society. The council was to consist of not less than 18 nor more than 27 members, and there were elaborate provisions to ensure that all the various interests were adequately represented. The president was to hold office only for one year, and a number of eminent men, not less than 10 nor more than 25, were to be invited to become vice-presidents. Overseas workers in the field of illumination could be invited to become corresponding members, without subscription. The amount of the ordinary subscription was to be one guinea, half of this sum being paid to *The Illuminating Engineer*, which was formerlly adopted as the official organ of the society. (It is, perhaps, worth noting here that, as the present value of the pound is less than one-fifth of its value in 1909, the present-day equivalent of the original subscription is over five guineas. Today the ordinary subscription [corporate member] is £3 10s.)

The Society's name

The name of the society was chosen deliberately, for Gaster had repeatedly stressed that the professional illuminating engineer would be a creation of the future and in the first Report of the Council it was stated that " The main object of the society is simply to provide an impartial platform where questions connected with illumination may be discussed. . . . Membership of the society does not by itself qualify anyone to be recognised as an ' illuminating engineer '."

The first president was Prof. Silvanus P. Thompson, whose presidential address was delivered at the first meeting of the society on November 18, 1909. Many of the suggestions he put forward for the work of the society were taken up in later years: he urged a greater study of the behaviour of the eye, with special reference to school lighting; the need for more frequent and widespread use of the photometer; the study of daylight and, in this connection, the desirability of close co-operation with the architectural profession. An interesting side-light on lighting conditions in 1909 is furnished by his remark that " reading is . . . comfortable with from 1½ to 3 or 4 candle-foot. . . . if the illumination exceeds 6 or 8 candle-foot, the glare of the page is again fatiguing and dazzling."

The early meetings

The membership at the end of 1909 was 157, of whom 27 were vice-presidents (a number of them overseas), and 45 (including 18 of the vice-presidents) were corresponding members. The early meetings were held in the building of the Royal Society of Arts in John Street, Adelphi. Those following the inaugural meet-

International relations

The IES has always laid stress on the international side of its activities and has worked consistently to maintain and develop relations with lighting engineers overseas. In the early years the extent of this activity was due in no small measure to Gaster, who had a remarkable flair for making contacts with lighting men in other countries. No doubt it was his influence, too, that was mainly responsible for the arrangement whereby many prominent workers abroad in the field of lighting were made corresponding members of the society almost as soon as it was formed. No less than 45 names in this class appear in the first list of members published at the end of 1909.

THE CIE

In 1911 Gaster attended the International Electrical Congress at Turin as a representative of the IES and toward the end of the proceedings he moved a resolution which ultimately led to the formation of the International Commission on Illumination. The resolution, which was passed unanimously, read as follows :—

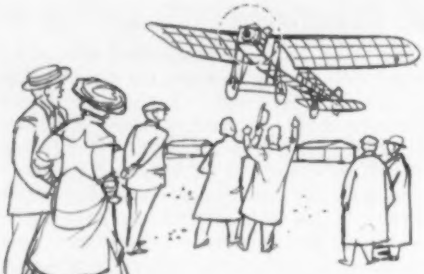
" This Congress deems it desirable that an International Commission should be nominated in order to study all systems of lighting and technical problems connected therewith ; and, having been informed that the Illuminating Engineering Society of London has the intention of forming such a Commission and of putting itself in touch with the other existing national and international photometric Committees, approves their taking the initiative in this respect."

The international body referred to near the end of the resolution was clearly the International Commission on Photometry which had been formed in 1900 at an International Gas Congress held on the occasion of the Paris Exhibition of that year. It had held meetings in 1903, 1907 and 1911, the last one only a few months before the Turin congress at which the resolution quoted above had been passed. Very soon, negotiations were started to extend the scope of the existing commission which, as its name implied, was concerned solely with the measurement of light, and to convert it into a body which would cover all aspects of lighting engineering. In August, 1913, there was a meeting in Berlin of representatives of nine countries who were members of the Commission on Photometry and a new constitution was adopted, together with a change of name to the International Commission on Illumination, otherwise the *Commission Internationale de l'Eclairage*, or CIE.

The man who had the greatest share in drafting the new constitution was Paterson and he was unanimously appointed honorary secretary. The president was Prof. Th. Vautier, who had presided over the Commission on Photometry since its formation.

One of the important features of the constitution of the CIE was that membership was made conditional on the formation of

Left : Sir Clifford Paterson, President 1928-29. Centre : J. W. T. Walsh, President 1929-30 and 1947-48. Right : S. English, President 1937-38



1909

From foundation to 'coming of age' *(continued)*

ing—in January and February, 1910—were devoted to a discussion of "Glare: Its Causes and Effects", opened by Parsons.

During the early years of the society discussions were arranged as follows: An exhaustive questionnaire would be drawn up and circulated to any members thought likely to be able to contribute remarks of interest. In particular it was sent to corresponding members overseas and, during the course of the meeting, the remarks collected in this way, or summaries of them, would be read by Gaster, as honorary secretary, or by Dow, his assistant.

The first anniversary dinner was held on February 10, 1910, again at the Criterion Restaurant, while at the fourth and fifth meetings—in March and April—the subject discussed was "The Measurement of Light and Illumination". The opening paper was given by Trotter, who was contributing to *The Illuminating Engineer* a long series of articles on the subject. These articles he subsequently revised for publication as a book under the title "Illumination, Its Distribution and Measurement". At the annual meeting in May the rule concerning the maximum length of service in the presidency was amended to allow the president to serve for up to three years, and Thompson was re-elected president for the following session. The remainder of 1910 (the year in which Edward VII died) was not specially notable in the annals of the society, but there were various signs of growing interest in lighting matters. Indirect lighting (then called "inverted lighting") was being advocated on account of its freedom from glare. It was installed in the lecture theatre at the new home of the Institution of Electrical Engineers but comment was not uniformly favourable, perhaps because the illumination provided was less than 2 lm/ft^2.

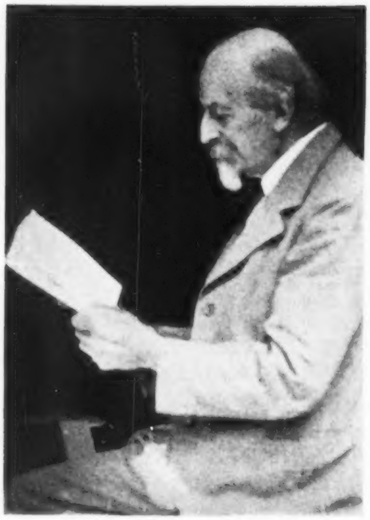
An interesting development at this time was the design of the first "Lumeter", described by Dow and V. H. Mackinney at the first annual general meeting of the society in May, 1910. It is worth noting that the instrument was designed originally for measuring "surface brightness" or luminance, as it is now called, and not illumination.

Technical committees

The year 1911 is notable for two reasons. Firstly, it was in 1911 that joint committees on street lighting, on school lighting and on library lighting were formed. The street lighting committee resulted from a proposal by the society to form a technical committee which was paralleled by similar action on the part of the Institution of Electrical Engineers. The subsequent developments are described elsewhere (see p. 56). The other two committees were set up as a direct result of meetings of the society at which the subjects of library and school lighting were discussed at length. The committees were "joint" in the sense that each included non-members of the society, nominated in the first instance by the Library Association and in the second by associations of teachers and by the Medical Officers of Schools Association.

The other reason for 1911 being a notable year typifies the international outlook of the society—a prominent feature from the time of its formation. At the International Electrical Congress at Turin in September, 1911, Gaster, on behalf of the British Illuminating Engineering Society, proposed a resolution which resulted, two years later, in the formation of the International Commission on Illumination. This resolution and the part played subsequently by the society in the work of this commission are described elsewhere (see p. 39).

Thompson remained president of the society, but in 1911 F. W. Goodenough (later Sir Francis Goodenough) succeeded Parsons as chairman of council. The two offices were kept distinct for a number of years and it was arranged that the chairman of council should preside at a meeting of the society if the president was



A. P. Trotter, President 1917-21

unable to do so. In 1912 the rule concerning the presidency was again amended. It was now laid down that, while the president should still be elected for one year, his eligibility for re-election would not be limited to any specified period and Thompson was re-elected for a fourth term of office in May, 1912. In the Report of the Council the use of the term "illuminating engineer" as a professional description was again deprecated.

The impartiality of the society

Before the society was formed there were not lacking those who prophesied that it would rapidly come to grief on account of bitter controversy between the advocates of the various illuminants, particularly gas and electricity. The pioneers were, however, undeterred by these gloomy prognostications and at a meeting in March, 1912, the lighting of printing works was the subject of two papers, one dealing with gas lighting and the other with lighting by electricity. A similar "double bill" was arranged for the following meeting when the subject was domestic lighting.

It was in this year that a study by D. R. Wilson (later Sir Duncan Wilson) of factory lighting conditions was published in the Report of the Chief Inspector of Factories. This work undoubtedly paved the way for the appointment by the Home Secretary in January, 1913, of a Departmental Committee on Lighting in Factories and Workshops. Four of the six members, including Parsons and Gaster, were members of the IES, as were both the secretaries, Wilson and C. C. Paterson (later Sir Clifford Paterson). The appointment of this committee was the first official recognition of the importance of proper and adequate illumination, and the various reports issued by the committee did much to

International relations *(continued)*

a national committee consisting of representatives of the principal national bodies concerned with lighting. For Great Britain the National Committee was composed of five representatives each from the IES and the Institutions of Gas and Electrical Engineers and two representatives from the National Physical Laboratory. The first meeting of the committee was held on January 2, 1914, when E. Allen, a representative of the Institution of Gas Engineers, was appointed chairman. On his death, in 1915, he was succeeded by W. Duddell, who held office until he died in November, 1917. Trotter then became chairman until his removal from London in 1920, when he was succeeded by Edgcumbe. It will be seen that, not unnaturally, the British NIC has, almost from the first, been presided over by a prominent member of the IES.

The British committee and its members have always played a very active part in the work of the CIE. Paterson continued to act as hon. secretary from 1913 until his death in 1948, except for a period of three years (1928-31) when he was president and his place was taken by Walsh. The honorary secretary is assisted by a paid general secretary, who is appointed by the commission on the recommendation of the honorary secretary. An appointment made in 1913 did not become effective owing to the outbreak of war, but from 1919 until 1948 the office of general secretary was always held by a member of the IES. The second British president of the commission—Dr. Walsh—is also a past-president of the IES.

In 1931, under Paterson's presidency, the CIE visited Gt. Britain for the first time. The session was held at Cambridge from September 14-19, many of the delegates being accommodated in Trinity College, where all the technical meetings were held. The session was preceded by an International Illumination Congress, which lasted from September 4 to September 11. Starting at Glasgow, it visited Edinburgh, Buxton and Birmingham in succession, and over 100 papers were read and discussed. On most days it was necessary to hold three meetings simultaneously. There were 140 delegates from overseas and 20 countries were represented at the meetings.

It will readily be understood that the organisational work involved in arranging such a congress, with the CIE session following it immediately, was extensive. As mentioned on p. 45, this work was carried out jointly by the IES and the National Illumination Committee and this collaboration was typical of the excellent relations which have always existed between the two bodies. (It is worth mentioning here that the Annual Report of the NIC has been published regularly, with a membership list, in *The Illuminating Engineer* and its successor *Light and Lighting*).

As one might have expected, the society has always been

A group of delegates at the International Congress 1931

1912

From foundation to 'coming of age' (*continued*)

improve lighting conditions in factories in the U.K. Their wider influence on general standards of lighting cannot be doubted and is referred to elsewhere (see p. 59).

The year 1913 was eventful in other ways. The Joint Street Lighting Committee produced a set of " Standard Clauses for a Street Lighting Specification ", while the Joint Committees on School Lighting and on Library Lighting also reported. At the National Gas Congress in October, Gaster read a paper on the " Aims and Objects of the IES ", and it was during the discussion on this paper that R. G. Shadbolt suggested that the society should hold meetings at certain centres in the provinces—a suggestion that was to be given effect years later by the creation of centres and groups. Meanwhile, in 1914, local representatives of the society were appointed in Birmingham, Glasgow, Leeds, Liverpool and Manchester.

At the last meeting of 1913 and the first one of 1914, the society broke new ground with a paper by P. J. Waldram on daylight and the natural lighting of buildings. It was Waldram who was mainly responsible for the notable part played by the society in later years in the promotion of research into natural lighting (see p. 68).

At the annual meeting in May, 1914, Silvanus Thompson retired from the presidency, a position he had occupied for the first five sessions of the society's existence. During that time it had grown in numbers from about 150 to nearly 500 and had achieved a recognised position among the cultural and technical societies of Great Britain. At the annual dinner in 1914, for example, the toast of " The Guests " was replied to by Sir William Crookes, president of the Royal Society. The new president of the IES was an eminent surgeon—Sir William Bennett—who held office until May, 1917.

The lumen

It was at the annual meeting in 1914 that Trotter read a paper on " The Nomenclature and Definition of Photometric Magnitudes and Units " in which he discussed the American report of 1912 on this subject and criticised the precedence given to the concept of luminous flux over that of luminous intensity. Although the idea of luminous flux, with its unit the lumen, had been introduced by Blondel as early as 1896, it had not hitherto received much attention from workers in the lighting field, but it is more than probable that the inadequacy of the traditional concept of luminous intensity, usually referred to as candle-power, was made more obvious by the introduction of the gas-filled lamp about this time. Whatever the cause, controversy between those who advocated the use of the lumen and those who wished to retain the candle for measuring the light output of a lamp was very keen.

The 1914-18 war

The outbreak of the first world war was soon followed by official restrictions on street lighting and on the lighting of shop windows. Meetings of the society continued more or less as usual and, following a discussion on " lighting fixtures ", there was a lengthy correspondence in the journal on a problem in terminology which is still not resolved.

The most noteworthy paper presented in 1915 was one advocating the rating of filament lamps in watts rather than light output—the rating universally used hitherto. At the same time, the author, F. W. Willcox, took the opportunity to urge the advantages of the lumen over the candle. In 1915 the first book to be published in this country on illuminating engineering made its appearance. This was Gaster and Dow's " Modern Illuminants and Illuminating Engineering ", produced by the publishing firm of Whittaker, later to be incorporated in Pitman's, who published the second edition in 1919.

As noted elsewhere (p. 60), the first report of the Factory Lighting Committee was issued in 1915 and it was discussed at a meeting of the society in November of that year. Another report of interest to the illuminating engineer, also issued in 1915, was that of a committee of the British Association on " School Books and Eyesight ". This report drew attention to the

The Trotter flare photometer

glare resulting from the use of glossy paper for school books, and it was in connection with the work of this committee that Trotter devised his " Gloss-Tester ".

It may be mentioned here that from January, 1912, "The Illuminating Engineer" had adopted a paper with a special surface which, while free from marked gloss, nevertheless gave excellent half-tone reproductions. The reading for this paper on Trotter's Gloss-tester was 11, as compared with 61 for the paper then being used for *The Times*.

The year 1916 cannot be passed over without mention of " daylight saving ", which came into operation for the first time in May of that year, and it is worth recording that the society's first research committee, appointed in 1914, made its first report in the same year (see page 73).

As the result of an approach by the IES in March, 1917, the newly formed Department of Scientific and Industrial Research set up a Joint Committee on Illuminating Engineering with Trotter as chairman. Trotter succeeded Bennett as president of the society at the end of the 1916-17 session and in his presidential address he referred to the society's relations with other technical bodies and to the war work being done by members, in particular that on the photometry of flares and star shells in which he himself took a leading part.

Other war work in which members of the society were actively interested was the photometry of radio-active luminous material, then extensively used for the marking on aircraft instrument dials, and studies of the light output from electric arcs used in searchlights, including the then novel high-current-density arcs.

The post-war period

At the end of the war the society was in a flourishing condition. The membership stood at about 500, meetings were held regularly and there were seven standing committees—two administrative committees (finance, and papers and editing) and five technical committees (school lighting, library lighting, eyestrain in cinemas, railway lighting, and progress in lamps and lighting appliances). The financial position, however, gave cause for anxiety, and in 1919 the council, which had the power to fix the amount of the subscription, decided that it was necessary to increase it to two guineas from the beginning of the 1919-20 session. At the same time a class of associates, with a subscription of one guinea, was created. This class embraced students and those not professionally connected with the lighting industry.

Trotter, having moved to the remote countryside to indulge in his favourite hobby of " remembering that he was no longer a government official", resigned the presidency at the

International relations *(continued)*

strongly represented in British delegations to sessions of the CIE, and its members have frequently contributed papers relevant to the work of the commission. This particular activity has not, however, been confined to the CIE, for from 1913 onwards papers on lighting have been presented by members of the society at one international congress or another.

CORRESPONDING MEMBERS

Although its participation in the work of the CIE, through membership of and collaboration with the National Illumination Committee is, perhaps, the most important of the society's international activities, there are a number of other ways in which the IES has maintained close contact with lighting personalities and organisations abroad. As mentioned on p. 40, corresponding members regularly contributed to the discussions at early meetings of the society, and, although this custom was allowed to lapse after a time, lighting engineers from abroad have frequently been invited to speak at the society's meetings, sometimes as lecturers at an annual general meeting (see p. 46), or as contributors to the discussion at ordinary meetings (when they are visiting the U.K.).

During recent years the society has arranged that, at its summer meetings, papers should be presented by distinguished lighting engineers from other countries and at the last summer meeting papers were given by authors from Belgium and Finland. Moreover, the summer meetings are usually attended by foreign lighting engineers, while members of the society attend from time to time meetings of kindred societies in other countries, particularly those in France and in the United States of America.

It was mentioned earlier that the society owed much of its original internationalism to its founder, Leon Gaster; it was, in fact, endowed at birth with an international outlook which it has never lost. It is not surprising, therefore, that it has a large number of overseas members. That these members total no less than 13 per cent of the total membership is something of which the society may well be proud.

A group of delegates at the CIE meeting at Scheveningen 1939

1914-18

From foundation to 'coming of age' (*continued*)

end of 1920 and his place was taken by Parsons. Committees were formed to study problems connected with motor-car headlights, the lighting of cinema studios, and the accuracy and methods of use of illumination photometers. At the opening meeting of the 1921-22 session the display of novelties in lighting, which on previous occasions had been on a modest scale, was substantially extended. It might be regarded as the forerunner of the displays now given regularly at Summer Meetings of the society.

The IES continued to work, both alone and in collaboration with other bodies, for the promotion of better lighting in various types of building. For instance, during 1922 and 1923, papers were read on industrial lighting, hospital lighting, the lighting of public buildings and the lighting of printing works. Also of note was the issue of the Second and Third Reports of the reconstituted Home Office Committee on Factory Lighting; the opening in 1923 of the Wembley Research Laboratories, with a large section devoted to illumination and light sources; and in the same year the reading of a paper by the Waldrams—father and son—describing the Waldram diagram for the predetermination of daylight. In *The Illuminating Engineer* for July, 1922, there was published an interesting *résumé* of the progress of the illuminating engineering movement in general, and of the society's work in particular, from the year 1908.

Illumination research

An important event in 1923 was the appointment by DSIR of an Illumination Research Committee in place of the committee appointed in 1917. The chairman of the new committee was Paterson and five of the ten original members were members of the IES. Some of the work of this committee, furthered by the society, which regularly brought its reports to the notice of illuminating engineers, is described elsewhere (see p. 74).

Interest in lighting matters continued to spread. Papers on the subject were read at the World Power Conference at Wembley in June, 1924, while a half-day conference on illuminating engineering was held on August 12 of the same year—again at Wembley, in the Palace of Industry of the British Empire Exhibition. The year 1924 also saw the establishment of the Lighting Service Bureau by the Electric Lamp Manufacturers' Association and the formation of the Institution (later the Association) of Public Lighting Engineers for the study of the special problems of street lighting.

In 1925 a course of twelve lectures on lighting was given at The Polytechnic, Regent Street, by prominent members of the society, while for the Faraday lecture, delivered in January, 1926, in various parts of the country under the auspices of the Institution of Electrical Engineers, Trotter chose as his subject " Illumination and Light ". The British Standards Institution (then the British Engineering Standards Association) formed an Illumination Section, and from 1926 onwards a number of specifications in the field of lighting were published.

The first informal meetings of the society were held in 1925, and visits were paid to some buildings of special lighting interest (e.g. a large store, a railway terminal and a theatre). These visits were followed by informal discussions relating to what had been seen.

In 1926 and 1927 several documents of importance to the lighting engineer were published. First there was the account of researches by H. C. Weston and A. K. Taylor into the relationship between lighting and performance in type-setting by hand. This account appeared in 1926, as did the first four Technical Papers of the Illumination Research Committee. In 1927 two more Technical Papers were published and this year saw also the publication of the first British Standard Specification for street lighting.

Critical times

Strangely enough it was at this time that the health of the society gave cause for a certain amount of anxiety. Attendance at meetings diminished and it was not unknown for a senior member to be pressed into service as chairman of a meeting at very short notice, even during the period of preliminary refreshments. It seemed as though some, at least, of the

enthusiasm of the pioneers had evaporated while that of the younger generation succeeding them had not yet had time or opportunity to find full expression. In 1924, Parsons had been succeeded as president by C. H. Wordingham, then Head of the Electrical Engineering Department of the Admiralty, and a man with many calls on his time and energies. After his death in January, 1925, there was no president until Wilson took office in the autumn of 1927.

The death of Gaster in January, 1928, marked the end of an epoch. It was undoubtedly his enthusiasm which had started the society and had infected others during its early years. He worked unremittingly, but it was fortunate for the society that from the very first he had had at his side a man who was content to remain very much in the background as long as Gaster was alive. Only rarely did Dow step into the limelight with some carefully considered paper, but he was, from the start, intimately associated with the running of the society and, when the time came, he stepped into the vacant place with no difficulty and there was no disturbance of the society's activities.

Soon, in fact, the society seemed to take on a fresh lease of life. Paterson was elected president for the session 1928-29 (he was to be made president of the International Commission on Illumination in the summer of 1928) and Dow became honorary secretary. The financial position was improved by the creation of a class of sustaining members who, in November, 1928, numbered 23. At the same time the class of country members, at a reduced subscription of one guinea, was created for people who lived 50 miles or more from London.

Early in 1929 a fund was opened to provide a fitting memorial to Gaster and, as a result, the Leon Gaster Memorial Premium, for the best paper presented during a session, was founded. The constitution of the society was amended at special general meetings held in February and July and, indicating the new spirit in the society, four meetings were held in provincial centres—Birmingham, Manchester, Newcastle and Glasgow. A second meeting was held in Birmingham early in 1930 and another in Manchester later in the same year. As part of the reorganisation, the committee structure of the society was simplified so that there were three main committees—General Purposes, Papers, and Technical, the last-named having three subcommittees dealing respectively with natural and artificial lighting in schools and with library lighting.

K. Edgcumbe succeeded J. W. T. Walsh as president for the 1930-31 session and during his term of office the council had two main preoccupations. For the previous two years preparations had been in hand for an international illumination congress to be held at various centres in Great Britain immediately before the meeting of the International Commission on Illumination, which was planned to take place in Cambridge in 1931. A joint committee of the IES and the National Illumination Committee was formed—both to raise funds for the project and to set up the necessary organisation. This committee was directed by C. H. Silvester Evans, a member of the society with unbounded energy and enthusiasm, strongly backed up by P. Good, then Deputy Director of the British Standards Institution and later president of the IES.

Incorporation

Another matter which engaged the attention of the council was incorporation. In 1930 the society was to celebrate its "coming-of-age", and it was felt that both in standing and in strength it was fully qualified to become a body corporate. Accordingly draft articles of association and by-laws were prepared and, with minor amendments, they were adopted at a special general meeting of the society held in July, 1929. They were printed in full in *The Illuminating Engineer* for August and became the basis of an application to the Board of Trade for the incorporation of the society. This application was made on June 17, 1930, and the certificate of incorporation was granted on November 24—within a week of the 21st anniversary of the society's first meeting.

During these first 21 years of the IES a substantial growth had taken place in the appreciation of the benefits of good lighting by the country as a whole. Dow's gentle gibe at encyclopaedias was no longer justified, and the current edition of the "Encyclopaedia Britannica" contained an authoritative article on illuminating engineering written by Gaster. The efficiency of electric lamps had more than trebled and in all types of building—industrial, commercial, educational and domestic—values of illumination regarded as good practice had shown a more than corresponding increase. Similarly much greater attention was being paid to good design, particularly with regard to the avoidance of glare. To what extent the society was responsible for these advances cannot, in the nature of things, be assessed, but that its avowed aims, as stated in its original constitution—"the advancement of the theory and practice of illuminating engineering and the dissemination of knowledge relating thereto"—were indeed being realised cannot be doubted. What the IES had set out in 1909 to achieve was steadily and surely being accomplished.

A BRIEF HISTORY OF THE SOCIETY: 2

From Incorporation to Jubilee

The year 1931 was a memorable one for the IES. Public interest in lighting matters was greatly stimulated in the autumn of that year when the visit of the International Commission on Illumination to the U.K. was made the occasion for floodlighting the principal buildings of London and of many provincial cities on a scale never previously attempted (see p. 64). For the society it was a busy time. The normal programme of meetings was carried through in spite of the heavy work involved in making the arrangements for the CIE session and for the International Illumination Congress which immediately preceded it. Noteworthy events were the award of the first Leon Gaster Memorial Premium to H. T. Young for his paper on "Modern Domestic Lighting"; the publication of a revised Street Lighting Specification; and the issue, by technical committees of the society, of three reports dealing respectively with the natural and artificial lighting of schools and the lighting of libraries.

BY contrast, the years 1932 and 1933 were uneventful, though a good deal of consideration was given to the creation of local centres of the society. Meetings were held in Manchester and Birmingham, and by the end of 1933 the first local centre—the North Western—had been established and was holding meetings in Manchester and Liverpool.

At the December meeting of the society A. W. Beuttell read a paper entitled "An Analytical Basis for a Lighting Code", which inspired research resulting later in a more logical approach to the assessment of the levels of illumination required for different visual tasks (see pp. 61 and 74).

The silver jubilee

The year 1934 was celebrated as the silver jubilee of the society and an award was created to encourage junior members to engage in research or to read papers on lighting subjects. Another move in a similar direction was the creation of a class of membership for "affiliated students"—junior members training as lighting engineers—who were to enjoy most of the privileges of membership at a much reduced subscription.

The annual general meeting of 1934 saw the beginning of the practice of asking a distinguished guest, either a lighting engineer from overseas or an authority in some field other than lighting, to give an address to members of the society. The guest in 1934 was S. G. Hibben, a prominent member of the American Society.

Toward the end of the 1934-35 session members were asked to vote on the day and time to be adopted for meetings of the society. Until 1932 there had been no fixed day of the week for meetings, but members seemed to prefer Tuesdays or Fridays. In the session of 1932-33 all the meetings were held on the second Tuesday of the month and the vote confirmed this arrangement. (All sessional meetings in London have since been held on that day.)

The session of 1935-36 was marked by the discussion of a number of proposals for improving the status and value of the society. Several of these had been put forward by Hepworth Thompson in his presidential address in October, 1934, and as a result of his remarks a special committee was appointed to consider the whole matter. This committee reported at a special general meeting of the society in September, 1935, and a number of the recommendations then made were adopted. Among the recommendations which were rejected was a proposal to change the name of the IES to the "Society of Lighting" and, in view of recent events, it is interesting to note that this proposal was turned down by a large majority. The recommendations which were accepted included those for the formation of a technical library, for the issue of *Transactions* as a separate publication and for the creation of specialised sections of the society. A suggestion that a distinction such as the title of "Fellow" should be awarded to members who gave evidence of having expert knowledge of the application of

light was approved in principle.

Steps were soon taken to form a library, although organising it took some time, and it was not until 1939 that the first list of books was published in the *Transactions*. The formation of specialised sections, on the other hand, proceeded quickly. The first meeting of the Photometric Section was held in February, 1936, having been postponed from January because of the death of George V, and that of the Industrial Lighting Section took place just a year later. Two other sections, one on Decorative Lighting and the other on Public Service Lighting, were formed in the autumn of 1937, and a fifth, on Commercial Lighting, in October, 1938.

It is worth noting that the practice of holding informal meetings of the society was revived in November, 1935. On this occasion the meeting took the form of a debate and was held in the St. Ermin's Hotel. In December of the same year, at a joint meeting with the Royal Photographic Society, R. G. Hopkinson read his paper on "The Photographic Representation of Street Lighting Installations". During the session of 1935-38 a class of "Privileged Members" was created. Not more than twelve persons, outside the lighting industry, were granted all the privileges of membership of the society, except voting powers, in recognition of their services, sympathy and interest in the society's work. In practice, they were generally holders of influential positions in the world of technical education.

Probably the most important of Hepworth Thompson's proposals was that the "Transactions" of the society should appear as an independent publication. This proposal was given effect from the beginning of 1936. Until that year the papers read before the society and reports of the subsequent discussions had appeared in *The Illuminating Engineer*, but now only a summary of the proceedings appeared in that journal and the full account was printed in the *Transactions*, together with announcements, lists of new members and other material of "domestic" interest. One of the early numbers of the *Transactions* was, in fact, the first IES code, under the title "Recommended Values of Illumination". This was re-issued, with amendments, in later numbers published in 1937 and 1938. The original page size of the *Transactions* was demy quarto ($11\frac{1}{4}$ in. x $8\frac{3}{4}$ in.), but in 1943 paper rationing made a reduction to octavo (9 in. x 6 in.) necessary. In 1958 the page size was increased to crown quarto (10 in. x 7 in.).

The lighting engineer

When the society was formed great care was taken to avoid giving the impression that membership implied any technical qualification. It was emphasised that the number of people who possessed the knowledge and experience that would entitle them to be described as illuminating engineers was very small indeed. However, as time went on and interest in lighting became more widespread, the need for qualified men increased and a number of commercial organisations had groups of specialists capable of advising on lighting problems.

Prof. J. T. MacGregor-Morris
President 1940-41

J. S. Dow
Hon. Secretary 1928-46
President 1946-47

Rt. Hon. Earl of Mount Edgcumbe
President 1930-31

1935

From Incorporation to Jubilee *(continued)*

It was natural that those who intended to make a career in lighting engineering should wish to have some criterion by which their competence could be judged on an impartial basis, and one of the proposals put forward in 1935 was that the society should award some form of diploma on the results of an "elementary examination in illuminating engineering". This proposal ultimately led to the institution of the City and Guilds examination, held for the first time in 1939. (A fuller account of this development will be found on p. 81.)

CENTRES AND GROUPS

The formation of the first local centre of the society in 1933 has already been noted. For the next three years meetings were held from time to time in various cities but it was not until 1936 that the second and third centres were formed in Glasgow and Dublin. Then the North Midland Centre, based on Leeds, was inaugurated in 1937, to be followed next year by the Midland Centre, with its headquarters at Birmingham.

When the formation of local centres was being actively considered it was generally agreed that a prerequisite should be a membership of 50 to 60 in the area, to be covered by a centre. The urge for decentralisation, however, soon led to further sub-division and in 1939 two "sub-centres" were formed, one at Sheffield, under the North Midland Centre, and the other at Nottingham, under the Midland Centre.

The proliferation of centres and sub-centres, later called groups, proceeded rapidly and by 1942 there were five local centres and six groups. The situation was not without administrative difficulties and a special committee, appointed to consider the matter, recommended in 1942 that from October 1943 the country should be divided into eight areas. Where an area contained more than one centre, an area committee was to be formed with representatives from each of these centres. If there was only one centre its committee was to act as the area committee. Finally, there was an Areas Joint Committee, consisting of representatives of the different area committees. This three-tier structure, although somewhat clumsy, survived until the end of 1947, when there were 13 local centres in seven areas, with five groups operating within local centres and one group directly attached to London.

The South Bank Exhibition, Festival of Britain 1951

The creation of local centres necessitated changes in the by-laws and arrangements were made for a limited degree of financial autonomy and for representation on the council. In the session of 1938-39 chairmen of local centres attended council meetings as ex-officio members and a meeting of centres chairmen was held for the first time on the day after the annual dinner in March 1939. It was at this meeting that the proposal was made to hold a summer meeting of the society at Harrogate in 1940.

When the areas were created, the chairmen of centres ceased to be ex-officio members of council and instead each area sent one representative to council meetings. At the beginning of the 1947-48 session, however, the original system was revived and each centre had a representative (not necessarily the chairman) on the council. In due course this led to the abandonment of area committees except where they were considered to provide a useful link between the different centres in a single area. From 1948 onwards there has been no mention of areas in the Council's Report.

The formation of local centres was at first followed by a marked increase in membership and they undoubtedly strengthened the society, but there were certain dangers which had not been entirely overlooked when the first centres were being formed. The chief danger was that the aspirations of a comparatively small number of enthusiastic members could lead them to exercise all their powers of persuasion to attract others to membership, until the number reached the minimum prescribed by the council for the formation of a new group. The group so formed would flourish for a while, but as time or circumstances removed the original nucleus of enthusiasts, keenness diminished, members lapsed and in a few cases, at least, the group had to be dissolved. Societies, like the individuals who compose them, learn by experience and it is unlikely that the mistakes of the past will be repeated in the years to come.

War work, 1939-44

In June, 1939, the International Commission on Illumination met at Scheveningen in Holland and less than three months later many of the

1939-45

From Incorporation to Jubilee (*continued*)

countries represented there were at war. Some time before the outbreak of hostilities the services of the society and its members had been placed at the disposal of H.M. Government and a joint committee of the IES and the Ministry of Home Security (ARP Dept.) was set up in June, 1939, under the chairmanship of the society's president, P. Good. A number of sub-committees were formed to consider specific problems referred to them by the Ministry, and by the end of the year there were 24 such sub-committees in operation, with at least a hundred members of the society serving on them. One of the main results of this work was the installation of very-low-intensity street lighting (see p. 57). Other matters dealt with included shop-window lighting, the design of masks for vehicle headlights and the lighting of shelter entrances and ARP signs.

War-time activities

In spite of the war the society continued its normal activities, though the *tempo* was somewhat reduced. Under the presidency of Prof. J. T. MacGregor-Morris, the opening meeting of the session of 1940-41 was held at the Royal Institution, and there were six other meetings before the annual general meeting in May, 1941. The society's first attempt to introduce a class of membership implying professional qualification was made in 1940, when another of the suggestions put forward in 1935 was revived, though not quite in its original form. The new class of Fellows, who enjoyed the double privilege of using the letters FIES and paying a higher subscription, embraced both practising lighting engineers and others who had attained some recognised position in a branch of illuminating engineering.

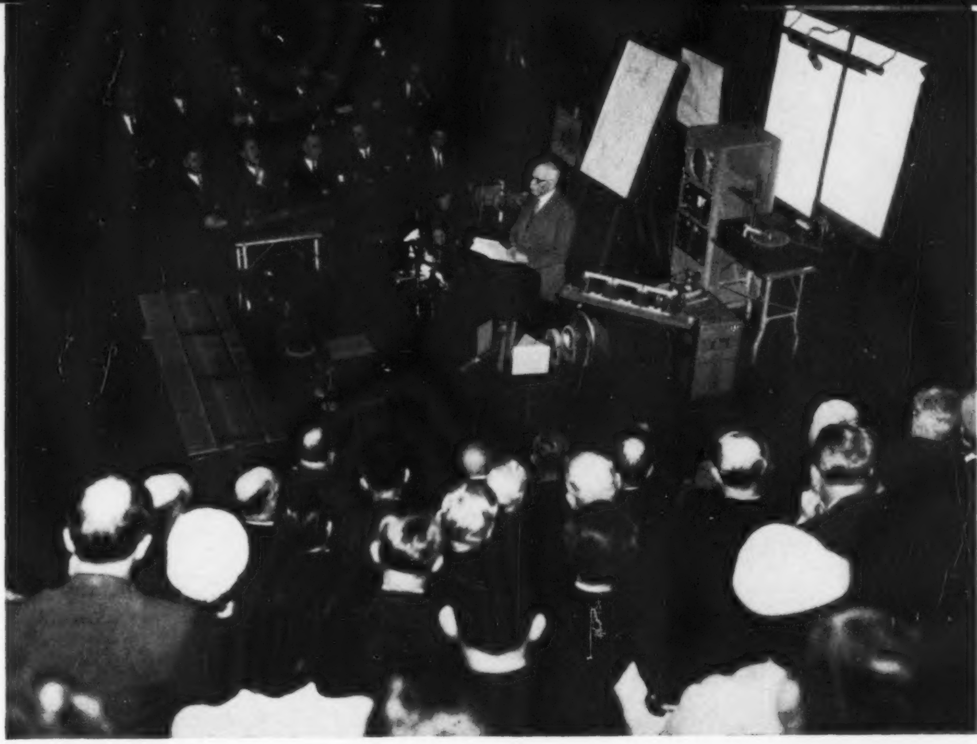
In February, 1942, a lighting committee was appointed by the Building Research Board of DSIR to advise on the lighting of post-war buildings. The work of this committee is described on page 63. Paterson was chairman and nine other members were drawn from the ranks of the IES.

Toward the end of 1943 the lectures to school children were started by R. O. Ackerley and W. R. Stevens (see p. 81). Ackerley was a moving spirit, too, in another attempt to spread a knowledge of lighting principles. In 1944 he and Alister Macdonald, a prominent member of the RIBA, gave a joint paper at a combined meeting of the society and the institute. This meeting was held in the RIBA building and was the first of a number of joint meetings intended to create a greater interest in lighting among members of the architectural profession, and to give members of the IES an opportunity of learning to appreciate the architect's point of view. Ackerley was especially concerned with this problem, and in 1948 he published "An Introduction to the Science of Artificial Lighting", written mainly for architects.

Post-war activity

By the end of 1946 the society had fully recovered from its second experience of war-time difficulties and again it emerged stronger than before. In fact it was mentioned in the Annual Report for that year that over 130 meetings had been held, while for the first time the membership exceeded 2,000. This growth was reflected in the income and expenditure account, which for 1946 showed a turnover of nearly £5,500. The corresponding figure for the 18-month period from June 30, 1909, to December 31, 1910, was just over £170.

As a contribution to post-war planning the society issued in 1944 and 1945 a series of "Lighting Reconstruction Pamphlets" (see p. 81), prepared under the direction of a special committee of the society set up in 1942 under Ackerley's chairmanship. These pamphlets were written to interest the many people who at that time were concerned that after the war no



Sir Lawrence Bragg delivering the fourth Trotter-Paterson Memorial Lecture at the Royal Institution 1957

opportunity should be missed of applying technological developments to the amelioration of living conditions. Several of these pamphlets, notably one dealing with the lighting of industrial premises, enjoyed a wide circulation.

Both 1945 and 1946 were years of great activity. There was a joint meeting with the Royal Meteorological Society in March, 1945, when Waldram read a paper on the " Measurement of the Photometric Properties of the Upper Atmosphere " in which he described an extensive series of investigations undertaken for a sub-committee of the Civil Defence Research Committee. This paper was one of several which described war-time research carried out by members of the society. Others were presented at a Symposium on Searchlights held by the society in April, 1947.

In April, 1945, Ackerley read before the Institution of Electrical Engineers a comprehensive paper on interior lighting by electricity, while in October a new and much extended edition of the IES Code was published. Classes of preparation for the City and Guilds examination were started at several polytechnics, one of which arranged in the following spring a full-time " resettlement course " in illuminating engineering.

The 1946 Convention

By far the most important event of the early post-war years was the convention held in London in May, 1946. This brought to fruition the plans laid in 1939 for a summer meeting at Harrogate. These plans, frustrated by the outbreak of war, were temporarily laid aside but were not forgotten, and from May 14 to 16 meetings were held in the building of the Institution of Electrical Engineers, while an exhibition of apparatus and equipment was staged in the Lighting Service Bureau at the top of the same building. The success of this convention was so great that it has become a biennial event in the society's programme, the venue being changed from time to time for the convenience of the large number of members living outside the London area.

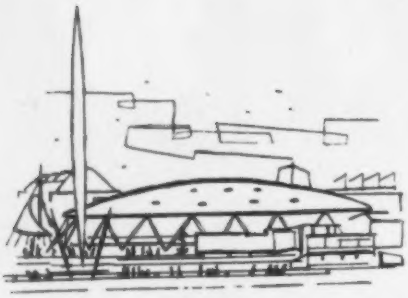
The society's new presidential badge was used for the first time at the meeting on December 10, 1946. It was appropriate that the first to wear it should be Dow, who had become president on October 1, being succeeded as Hon. Secretary by Weston, his immediate predecessor in the presidential chair.

The society's secretariat

All the activities mentioned above, coupled with the increase in membership and, therefore, in the day-to-day work of the office, made it imperative for the council to consider the appointment of a paid secretary to assist Dow who, like Gaster, had served the society throughout in an honorary capacity. In July, 1945, it appointed R. Pye as the first secretary, and a little over a year later he was succeeded by the present secretary, G. F. Cole, who, ever since Dow's death in 1948, has carried the main burden of the administrative work involved in the conduct of the society's affairs.

It may be remarked here that the year 1946 saw the beginning of what was to become an outstanding development in lighting engineering, i.e. the application of the tubular fluorescent

1951



From Incorporation to Jubilee (*continued*)

lamp to street lighting (see p. 58). The fluorescent lamp formed, too, the subject of a broadcast talk given by Paterson, now Sir Clifford Paterson, in November, 1946.

The register of lighting engineers

Training and qualification were matters with which the society was much concerned at this time. In 1945 it published proposals for a complete scheme of training to include not only the gaining of educational qualifications, both general and specialist, but also a period of practical experience. This scheme, however, was never widely adopted.

Meanwhile many members who were professionally engaged in lighting engineering were insistent that the society should provide some hall-mark which would distinguish the qualified lighting engineer from the other members. The class of Fellows, created at the end of 1939, was originally intended to meet this need, but it included, in addition to those professionally qualified, a number of members of the society who had distinguished themselves in other fields, notably research, and it was not, therefore, an unambiguous hall-mark of the kind desired.

After much discussion it was decided in December, 1947, not to create a new class of membership but to form, within the membership, a register of lighting engineers, inclusion in which was open to any member of the society provided he possessed certain educational qualifications and gave evidence of practical experience and ability. Everyone admitted to the register was entitled to describe himself as a "Registered Lighting Engineer (IES)"—an aspect of the scheme which bore within it the seeds of dissolution, as will be noted later.

Two meetings of special interest were held in 1947. One, in February, was devoted to a report of a committee set up by the society in 1943-44 at the request of the Ministry of Transport to study various matters connected with the legibility at night of illuminated road traffic signs. The other was the Symposium on Searchlights to which reference has already been made.

The passing of the giants

In the years 1947 and 1948 the society suffered severely from the loss of three of its most eminent members. Trotter, the pioneer of lighting engineering in the U.K. and a founder member of the IES, died on July 23, 1947. His interests had been wide and his reminiscences, completed shortly before his death, are deposited with the Institution of Electrical Engineers. An abridgment is included in the IES library. Just over a year later, on July 26, 1948, another founder member, C. C. Paterson, died. A few days before he had been presented with the American Society's Gold Medal, in recognition of his many contributions to the development of lighting practice over almost half a century. Less than three weeks later, members of the society were shocked to learn of the death of J. S. Dow, who had collaborated with Gaster in founding the society, shared in the conduct of its affairs until Gaster's death and acted as honorary secretary until elected president in 1946.

In 1947, J. W. T. Walsh became president for the second time, and in the following year, besides holding its first provincial summer meeting at Harrogate, the society participated in two events of importance to lighting engineers. The first was an exhibition at the Science Museum which, under the title "Darkness into Daylight", showed the progress of lighting technology from early times to the present day. The other was the first post-war meeting of the International Commission on Illumination, which was held in Paris and was attended by some 68 delegates from the U.K., nearly all of them members of the IES.

The following year was one of steady but unspectacular progress. The most noteworthy event was the revision of the conditions for Fellowship of the society. As noted earlier, the Fellowship originally served a double purpose. It was awarded as a distinction and it

The Coronation of H.M. Queen Elizabeth, Westminster Abbey 1953

was used as an indication of professional competence. This latter, however, was now provided more unambiguously by the Register of Lighting Engineers and it was considered logical, therefore, to revise the conditions for Fellowship so as to emphasise that it was a distinction.

Two papers heralding important developments in widely different lighting fields were read before the society in 1950. In January, P. Petherbridge and R. G. Hopkinson gave an account of their work on discomfort glare (see p. 75), while in April E. S. Calvert described the crossbar system of lights in the approach area of a landing field for aircraft. This system, further developed since the paper was presented, has been widely adopted both in the U.K. and abroad.

Festival of Britain year

The year 1951 was noteworthy for several events which may conveniently be taken in chronological order. January saw the delivery of the first Trotter-Paterson Memorial Lecture at the Royal Institution. This lecture was established to commemorate the work of Trotter and Paterson, and the first lecturer, Dr. Walsh, taking as his theme "The Early Years of Illuminating Engineering in Great Britain", showed how these two men, between them, had

been closely associated with every lighting development which had taken place in this country over a period of more than 50 years. The lecture is given biennially. Subsequent lectures have been given by Lord Adrian, Sir Harold Spencer Jones and Sir Lawrence Bragg. It is remarkable that two of these three lecturers since 1951 have been Nobel Laureates. The lectures have all been given at the Royal Institution, which is also the traditional venue for the presidential address each autumn.

The President of the IES for the session 1950-51 was L. J. Davies, who was also the Faraday lecturer of the Institution of Electrical Engineers. He chose as his subject " Lamps and Lighting—a Record of Industrial Research" and in February he gave this lecture, with a wealth of demonstration, to a large audience in London and, as is customary, repeated it at a number of centres in the provinces both before and after the London presentation.

The Festival of Britain was an occasion for the use of lighting effects of many types, both in the exhibition grounds and elsewhere, perhaps the most striking feature being the internally illuminated " Skylon ". The Festival Hall, too, provided an outstanding example of well-designed auditorium lighting. This hall was used for the closing session of the Building Research Congress held in September under the auspices of DSIR. One section of this international congress was devoted to lighting, and at the four meetings arranged for this section twelve papers, several of them by members of the IES, were read and discussed.

Informal meetings

It will be seen that 1951 was a busy year for the society and its members. Some relaxation in 1952 was welcome, therefore, and this was provided at an unusually informal meeting in January. The pre-war practice of holding informal meetings during a session had been revived in 1947, though they varied considerably in character. Some were purely technical and, although no paper was read, a subject of lighting interest was discussed—first by a selected speaker or speakers, then by the audience. Other informal meetings had a more "popular" character. Thus, in November, 1949, and again in March, 1952, a brains trust was held, with a member of the society who is a well-known broadcaster as question-master. At another meeting in 1949 there was a debate on the motion " That standardisation impedes progress in lighting ".

At the meeting in January, 1952, the Papers Committee staged " *Papier Mâché* ", a far-from-serious " dramatic fragment on how to write and present a paper ". This was not the first occasion on which members of the IES had exhibited their histrionic talents. At an informal social evening in February, 1937, after a mock lecture by Prof. Hoodlesnoop (G. H. Wilson), a dramatic sketch entitled " Lumens at Law " was produced. Some years later, during the Convention of 1946, there was a social evening with a " double bill " of scenes from the " Story of Light " and an opera full of topical allusions intended to appeal particularly to IES members.

The Dow prize

There were long, protracted discussions on the best way in which the society could commemorate the outstanding work done on its behalf for many years by J. S. Dow, using for this purpose the interest on the capital sum which he had left to the society at his death. It was finally decided to award a substantial prize, to be known as the Dow Prize, in a biennial competition that would encourage collaboration between students of lighting engineering and students in one of those professions in which a knowledge of lighting is important. For the first competition, held in 1952, the collaboration was to be with architectural students and a number of entries of a commendable standard were received. In the second competition, held in 1954, the entries were not as good and the prize was not awarded. In 1956 the form of the competition was changed and prizes were offered for essays written by members of the society.

In 1953 the coronation of Queen Elizabeth II was the occasion for the most lavish display of spectacle lighting ever seen either in Great Britain or elsewhere, and members of the society were responsible, not only for the many vast schemes of exterior lighting arranged up and down the country, but also for the lighting inside Westminster Abbey during the actual ceremony. It was this lighting that made possible the world-wide television broadcast, without impairing the dignity of the occasion.

In the following year the society held its fourth summer meeting—at Southport. (The third had been held at Eastbourne in 1952.)

Another noteworthy event was the formation of the first overseas section—in South Africa—inaugurated as a Group at Johannesburg in February, 1954, and raised to the status of a Local Centre in the following year.

It was at a meeting of the Society in 1954 that Waldram described a new method of lighting design for interiors (see p. 63).

The society's name

In May, 1955, the first of a series of biennial joint meetings of the Edinburgh, Glasgow and Newcastle centres was held at Peebles. In the autumn of the same year, lighting was one of the subjects discussed by the Physiology Section of the British Association and of the four papers read on that occasion, three were by members of the society. During 1955 intense controversy arose over a proposal to change the society's name. Dissatisfaction with the name had been expressed from time to time for many years. As already recorded, a proposal was made in 1935 to change the name to "The Society of Lighting". The idea was revived in 1955 because a number of members of the society whose names were on the Register were anxious to have some more convenient description than that of "Registered Lighting Engineer (IES)". Although this was, in fact, quite a separate matter, by no means necessarily connected with a change in the society's name, the two ideas became almost inextricably interwoven in the course of discussion.

The Presidential insignia

The proposals which finally emerged from a welter of argument were (*a*) to change the name to "The Lighting Society" and (*b*) to introduce a new class of "Diploma Members" in place of the Register. At a special general meeting of the society in March, 1957, the second proposal was accepted but the first was rejected by an overwhelming majority, so that today the society is still the Illuminating Engineering Society, as it was 50 years ago. The Register ceased to exist and most of those whose names were on it became Diploma Members, although some, who were also Fellows, preferred to remain in that class of membership rather than transfer to the new class.

Classes of membership

The new arrangement brought to an end the anomaly that professional qualification was recognised partly by membership of a class which was not used exclusively for that purpose, and partly by a rather clumsy device which cut across the membership divisions. Henceforth it was to be definitely associated with the class of Diploma Member, leaving the Fellowship for those who had "achieved an outstanding position in, or made important contributions to lighting".

One other change worth noting here was made in 1957. The original constitution of the society provided for the election of honorary members and such men as Preece, Swan and Edison were made hon. members in the early years. At the time of incorporation it was laid down that not more than one honorary member was to be elected in any one year and that the total number should not at any time exceed six, and this position remained unaltered in 1957 except that the maximum number was raised to ten, the Honorary Members at that time being Ward Harrison, Howard Long, J. W. T. Walsh, H. C. Weston, J. T. MacGregor-Morris and Sir John Parsons. In 1957, however, a new class of Honorary Fellows was created, to include "any distinguished person whom the society desires to honour for services rendered to the society or whose association therewith is of benefit to the society". The number may not exceed six and so far no elections have been made.

The end of the beginning

So ends the story of the first 50 years of the society's existence. Some aspects of its work are described more fully on other pages, but an attempt has been made here to give a complete picture in outline of the way in which the IES has grown, both in numbers and in stature. It was fortunate in its founder members and it has been fortunate in the men who have helped to shape its destinies over the first half-century of its existence.

What of the future? It was suggested recently by a distinguished past-president that the time had arrived for the society to become a professional body, with appropriate entrance qualifications. It may well be questioned, however, whether such a fundamental change would be beneficial either to the society itself or to the community at large. In the past, members have set themselves the task of bringing home to every user of light—and that means every member of the community—the benefits to be enjoyed as a result of good lighting. In pursuit of this aim they have done all they could to interest members of other professions, notably the medical profession and the architectural profession. Will they succeed better by closing their doors to all except the practising lighting engineer? Unforunately there are no precedents to serve as a guide. The American Society, two years older and with a much larger membership, has not made the experiment.

It would be rash to prophesy what changes may be found desirable during the next 50 years, but it is certain that the society may confidently look forward to a steady growth in numbers and in influence, so that it may continue to live up to its ambitious motto:

PASSIM SPARGERE LUCEM

THE ROLE OF THE SOCIETY IN IMPROVING LIGHTING PRACTICE

Street lighting

It is remarkable that over and over again in the history of lighting, the introduction of a fresh technique has occurred first in the lighting of highways, only later being applied to other branches of lighting practice. An outstanding example is the illumination photometer, the first instrument being devised, and the first measurements of illumination being made for the purpose of comparing different systems of street lighting. It was Trotter's association with this work that led to his interest in lighting and so to the writing of his classical paper read before the Institution of Civil Engineers in 1892. In this paper he made definite recommendations concerning street lighting, and it is not surprising, therefore, to find that one of the early activities of the IES was the appointment of a committee on this subject with Trotter as its chairman. Almost immediately it was discovered that a similar committee was being set up by the Institution of Electrical Engineers and an approach was made to that body with the result that five members of the IES, including Trotter, were invited to serve on the IEE committee. (The committee included also representatives of the Institution of Gas Engineers and the Association of Municipal and County Engineers.)

THE Committee completed its work in 1913 and its report, entitled "Standard Clauses for Inclusion in a Street Lighting Specification," was introduced by Trotter and discussed at a meeting of the society in April of that year. The principal clause, from the point of view of the lighting engineer, was one which classified streets according to the minimum illumination on a horizontal plane 39 in. above the carriageway, the values ranging from 0.01 lm/ft^2 for Class A streets to 0.10 lm/ft^2 for Class E. **As Trotter, with remarkable prescience pointed out, this left some 20 letters available "for such higher classes of illumination as the progress of civilisation may call for."**

There is little else to record before the outbreak of the 1914-18 war which put an effective stop to all further progress, though an interesting report by Gaster on the relation between street lighting and accidents was presented to the society at the end of 1915.

A long silence was broken when Haydn T. Harrison, who had been active in street lighting before the war and had read a paper on the subject before the IEE in 1911, opened a discussion at a meeting of the society in December, 1922. He and other members of the society were working hard on the design of fittings and it was at about this time that Harrison introduced a highly directive reflector, the "L.L.L. Street Lighting Unit," to be followed later by the "Bi-multi" fitting which soon enjoyed a considerable vogue.

A British standard specification

At this time the principal aim of the designer of street lighting fittings was to achieve greater uniformity of illumination along the carriageway, which meant, in effect, that the maximum luminous intensity was directed towards the mid-span point. A committee of BSI (then the British Engineering Standards Association) under the chairmanship of Paterson, and largely composed of members of the IES, was working on a specification for street lighting. In the first edition, published in 1927, streets were classified by the illumination at the mid-span point, the values in the various classes ranging from 0.02 to 2 lm/ft^2. It was soon found, however, that such a specification led to too great an emphasis on the illumination at this particular point, to the neglect of the remainder of the roadway, and the committee was soon hard at work preparing a revision which would overcome this difficulty.

In the revised specification of 1931 it was laid down that the (calculated) average value of illumination on the roadway and the maximum value should

F. C. Smith
President 1939-40

J. M. Waldram
President 1948-49

be stated, as well as the illumination at the mid-span point. Further, both mandatory and recommended figures were given for the mounting heights and the spacing-height ratios appropriate to each of the various classes.

The years 1931 and 1932 were marked by the introduction of discharge lamps for street lighting. The form of the new light source, especially in the HPMV lamp, was quite unlike that of the tungsten filament and entirely different lanterns had to be designed. The high efficiency, however, made possible a much more rapid improvement in the lighting of traffic routes.

The departmental committee

The year 1934 was important in the history of street lighting in the United Kingdom for it was in June of that year that the Minister of Transport appointed a departmental committee on the subject. Four of the nine members were from the IES and both the society and the Association of Public Lighting Engineers (formed in 1924 as the Institution of Public Lighting Engineers by a number of members of the IES professionally interested in street lighting) were called upon to give evidence.

Lonsdale Road, Barnes, where the Departmental Committee of the Ministry of Transport carried out street lighting tests 1934-37

The committee published an interim report in 1935 and a final report in 1937, and in these reports the use of illumination as a criterion of the quality of a street lighting installation was entirely abandoned. This decision was mainly the result of work done in Great Britain by G. H. Wilson and others who had shown that the important factor in street lighting was road surface brightness, not illumination alone. The reflection characteristics of road surfaces had been studied (see p. 74) and the principles on which street lighting could be designed to give good "silhouette vision" had been established.

Toward the end of 1937 the IES formed a special section, named the Public Lighting Section, for the study of street lighting and the lighting of public buildings. At about the same time the society's Technical Committee published a useful document entitled "Recommendations concerning the use of portable photometers, particularly for street lighting measurements."

In the course of its work the departmental committee had initiated a number of research programmes on different problems affecting the performance of a street lighting installation. At a meeting of the society in November, 1938, this research was described in three papers presented by the members who had been mainly responsible for carrying out the work. The titles of the papers were respectively (a) "The Revealing Power of Street Lighting Installations," by J. M. Waldram, (b) "Necessary Values of Brightness Contrast in Artificially Lighted Streets," by C. Dunbar; and (c) "Reflection Factors and Revealing Power," by F. C. Smith.

ARP lighting

The first effects of the committee's report were beginning to show themselves when the outbreak of the 1939-45 war prevented any further developments and the energies of many members of the society were diverted to the problem of providing some alleviation of the complete black-out ordered immediately prior to the commencement of hostilities.

Even before the outbreak of war it had been realised that, if some form of lighting, so low in intensity as to be invisible from enemy aircraft, could be devised, it would do much to raise morale, besides facilitating movement and reducing accidents in the black-out. In consequence, the president of the IES, Percy Good, made contact with the Home Office and a joint committee was formed under his chairmanship to work out a scheme. This committee worked hard and prepared specifications, published by BSI, for fittings which would provide moderately even illuminations of 0.002, 0.02 and 0.2 lm/ft^2. The first of these specifications appeared in September, 1939, and before the end of the year the so-called "synthetic starlight" from these "ARP lanterns" had actually been provided on some streets in Westminster.

Another specification dealt with the whole subject of street lighting under war-time conditions and, later, a joint report was issued by the IES and the Ministry of Home Security on "War-time Street

A modern street lighting installation

Lighting and Aids to Movement in Streets," the report being discussed at a meeting of the society in December, 1940.

Some time before the end of the war, plans were made for a resumption of full street lighting at the earliest possible moment and very soon after the black-out was lifted several towns had their street lighting in operation once again.

Post-war progress

After 1945 progress in street lighting in the United Kingdom was rapid and continuous. The recommendations of the departmental committee were adopted (at least, for new schemes) as guiding principles, and, in fact, the committee's report served for some years as a specification. There was, however, a recommendation in the report that its provisions should be codified in a British Standard Specification for street lighting and, before the end of the war, a committee of BSI, composed mainly of members of the IES, was working hard to implement this recommendation. A draft was prepared and circulated for comment at the end of 1945. It was thoroughly discussed at a meeting of the society in January, 1946, and the comments made on that occasion, as well as those received by BSI from other interested organisations, indicated clearly that there were strong objections to anything of the nature of a specification. It was felt that the necessary rigidity of such a document might well tend to stifle, or at least to impede, progress in a branch of lighting practice which was developing more rapidly than any other at that time. In 1946, therefore, the decision was made to abandon the attempt to draft a specification and to prepare instead a code of practice which would give as much guidance as possible to local authorities, without in any way hindering progress or discouraging experiment.

The wisdom of this course was soon apparent and special attention was drawn to the need for flexibility by events which took place in the closing months of 1946. In October of that year Bond St. was lit by "warm white" fluorescent lamps and in December an installation of "daylight" lamps of the same type was put into service in Brompton Rd. The use of fluorescent lamps for street lighting was not entirely new; installations had been tried out in America but reports on them were discouraging. Since the time of the Bond St. and Brompton Rd. experiments, however, the use of tubular fluorescent lamps for street lighting has spread rapidly both in Great Britain and abroad and is now generally accepted as a satisfactory form of lighting, especially where circumstances make the use of sodium or mercury lamps unacceptable on account of the colour distortion they cause.

There is no doubt that the standard of street lighting in the United Kingdom is now higher than anywhere else in the world—a situation that has been brought about by a combination of favourable circumstances. The work on road surface brightness and the importance of silhouette vision greatly influenced the deliberations of the departmental committee and its report. Concurrently with this work, the use of discharge lamps for street lighting was spreading rapidly. After the war came renewed activity—at first on the same lines as before the war but later expanded to include the use of tubular fluorescent lamps. This development led to renewed activity in the design of fittings and the use of plastic materials for these fittings became more and more widespread.

The code of practice

Progress was to a certain extent consolidated by the publication of the long-awaited code of practice. This was the fruit of much deliberation on the part of a small group, mostly members of the IES, who formed a drafting sub-committee of the main BSI Committee on Street Lighting. The code was issued

Haydn Harrison
President 1932-33

in two parts—the first, dealing with the lighting of traffic routes, appeared in 1952, followed in 1956 by the second part, which dealt with the lighting of other roads.

Even higher standards

Today, there is a feeling that progress should not be halted and that traffic now requires, in certain areas, a standard of lighting far higher than that provided for in the code. This feeling was expressed strongly in a paper read before the APLE in September, 1957, and members of the society, now hard at work on a revision of the code, are considering street-lighting installations in which the minimum illumination is between 2 and 3 lm/ft^2. When this level is compared with the modest value of 0.1 lm/ft^2 which was the highest contemplated in the "Standard Clauses" of 1911, referred to at the beginning of this article, the wisdom of Trotter's remark, whether made in earnest or in jest, becomes obvious.

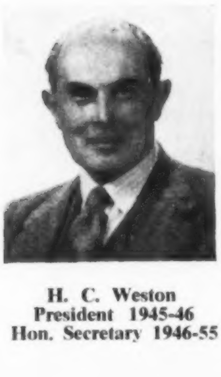
In conclusion, it may perhaps be mentioned that progress in public lighting has not been confined entirely to street lighting. Floodlighting is dealt with separately in an article commencing on p. 64 but the lighting of bridges and tunnels has only recently begun to receive the attention it deserves and much thought is now being devoted to this subject. A recent paper by two members of the society has indicated certain lines along which future experiment may proceed with some expectation of success.

The lighting of building interiors

Some of the ways in which The Illuminating Engineering Society, almost from the time of its formation, set out deliberately to improve standards of interior lighting have been referred to elsewhere. Such, for instance, was the appointment in 1911 of a joint study committee on library lighting and another on the lighting of schools, but by far the most important influence was exerted less tangibly—at the meetings of the society where people interested in lighting from various viewpoints were brought together. New and interesting installations were described and the latest ideas were ventilated and discussed. Thus, during the second session of the society (1910-11) there was an important paper by Goodenough on "The Progress and Status of Gas Lighting", followed the month after by one on "Recent Progress in Electric Lighting."

IT is impossible to doubt that papers such as these inspired further progress in these subjects, this progress becoming the subject of papers read at later meetings. Thus the work of the society was carried forward. Indeed, this progress is demonstrated by the fact that in the spring of 1912 several papers were read on the lighting of shops, printing works and private houses, while in December of that year indirect lighting was dealt with at considerable length. The papers were often followed by lively discussions and, in this way, the principles of good lighting were gradually established, mistakes were corrected and progress along sound lines was assured.

Any development in light sources, or the introduction of a new technique, was quickly brought to the notice of members of the society. For instance, in March, 1914, there was a paper by W. C. Clinton on the comparison of estimated and observed values in interior lighting, while at about the same time the advent of the gas-filled lamp (then often referred to as the "half-watt" lamp) was announced.



H. C. Weston
President 1945-46
Hon. Secretary 1946-55

Side by side with this self-education went the exposition of good lighting practice both to students and to the layman, partly by lectures and partly by the written word.

Factory lighting

During the early years of the society's existence the way was being paved for steady improvement in the large and important field of factory and workshop lighting. The work of D. R. Wilson, which led to the setting up of a Home Office committee on factory lighting is referred to briefly on page 41. The work of that committee leading to the publication of its First Report is described in detail on p. 60 and there is little doubt that this report was the most important single factor in helping forward the society's work for the improvement of lighting conditions in general. Although concerned primarily with factories and workshops, the report provided, by implication, authoritative support and weighty evidence for the desirability of good interior lighting everywhere.

Unfortunately, further progress was hampered by the 1914-18 war but, within a comparatively short time after the cessation of hostilities, there was a burst of activity for which the IES was in no small measure responsible. On the commercial side, several organisations interested in the supply of lighting equipment established special departments to deal with lighting engineering, while in 1924 the Lighting Service Bureau was established and began its work of demonstrating to all the principles of good lighting and the benefits to be derived from it.

In 1920 the Factory Lighting Committee was reconstituted, with W. C. D. Whetham taking Sir Richard Glazebrook's place as chairman, and Wilson as a member of the committee. The joint secretaries were J. W. T. Walsh (who had conducted the survey mentioned on p. 60) and H. C. Weston. In the second report of the committee, issued in 1921, recommendations were made concerning such matters as the limitation of glare, the prevention

of troublesome or dangerous shadows, and the avoidance of objectionable flicker. The third report, which followed in 1922, went a good deal further and made recommendations concerning the values of illumination needed for different classes of work. Processes were listed in two classes, designated respectively as "fine work" and "very fine work." The illumination considered appropriate for the former class was 3 lm/ft², while for the latter class 5 lm/ft² was recommended. The committee stated specifically

Sir Duncan Wilson, President 1927-28

that the values they gave were to be regarded as "recommended practice" and "to serve as guides in determining whether lighting is adequate."

Matters were left in this "advisory" state until 1937 when for the first time in factory legislation in the United Kingdom, the Factories Act contained a requirement in general terms for the provision of adequate and suitable lighting in factories. It gave the Secretary of State power to lay down standards of lighting for any class of factory or for any process. This naturally led to the revival of the Factory Lighting Committee, five of the eleven members, including the chairman, D. R. Wilson, being members also of the IES.

The committee's fourth and fifth reports were isued in 1938 and 1940 respectively. The former again contained recommendations on glare, the avoidance of undesirable shadows and the elimination of flicker, but the only illumination values mentioned were those recommended for such general lighting of indoor and outdoor areas as was needed to facilitate movement and prevent accidents. Concerning the illumination required for different classes of work, the committee referred to the tables of recommended values published by the IES (see p. 61).

The fifth report was published after the outbreak of war, when factories were entirely blacked out at night. In many of them, operatives were working 24 hours a day on a shift system and the report was specifically related to the conditions then prevailing. This report formed the basis for the Factories (Standards of Lighting) Regulations (S.R. and O., No. 94), issued in February, 1941, which prescribed, with certain exceptions, a general illumination of 6 lm/ft², without prejudice to the provision of higher values when called for by the nature of the work. It contained also provisions concerning glare, shadows, etc., based on the recommendations in the fourth and fifth reports of the committee.

As early as 1917 a report issued by the Cinema Commission contained recommendations on the

The Departmental Committee

IN 1911 a Departmental Committee on Accidents in Factories and Workshops devoted part of its report to the relationship between illumination and accident rate. The evidence given before this committee caused D. R. Wilson, then an inspector of factories and later to become Chief Inspector, to take an interest in the matter. Wilson had joined the IES shortly after its formation and in 1911 he made a number of measurements of illumination in different types of factory throughout Gt. Britain. The results of his work were published in the form of a long appendix to the Report of the Chief Inspector of Factories for 1911. That this work of Wilson's, backed by the influence of the IES, led to the appointment of the Home Office committee on factory lighting there can be no doubt.

After its appointment the committee lost no time in beginning its deliberations, taking evidence from a wide variety of individuals and organisations and carrying out an extensive survey of existing conditions. Among those giving evidence were a number of members of the IES, some speaking as representatives of the society, others simply as experts on lighting matters. The survey was extensive: in all, 163 rooms in 57 factories were visited and measurements of the illumination were made with visual photometers at a number of points in each room, both by natural and artificial light. The results were analysed and the frequency curves drawn for each industry give an interesting picture of conditions at the time of the survey (1913-14). For instance, the peak of the frequency curve for the artificial illumination in foundries occurs at slightly below 0.2 lm/ft², while in spinning mills the peak is at about the same value and it is noted that over 60 per cent of the measured values lay below 0.5 lm/ft². Even in weaving sheds the peak is only about 1.1 lm/ft², with half the measured values below 2 lm/ft².

The committee, in its First Report, issued in 1915, made a number of recommendations for general lighting, the highest value of illumination mentioned being 0.4 lm/ft² (for foundries), but concerning the illumination of the work it recommended that the Secretary of State should be given the power to make Orders defining adequate and suitable lighting in specific instances.

These modest recommendations were not, however, given statutory force until 1937 and there is no doubt that the principal effect of the committee's work was to demonstrate how greatly the lighting in many factories fell below even the standards of that time and to provide a basis for much useful persuasion by the Factory Inspectorate in discussions with managements.

Before closing this brief account of the early work of the committee it is worth noting that an investigation staged at the National Physical Laboratory, and described in an appendix to the First Report, showed that the illumination required for seeing on self-coloured material was inversely proportional to the reflection factor; that 5 to 6 lm/ft² was required for work on a dark material; and that detail in self-toned fabrics could be seen much better by direct than by indirect light. The fact that such an investigation was needed by the committee and that it was thought useful to record the results mentioned, provides a good indication of the extent to which facts which are taken for granted today were unknown in 1915.

lighting of auditoria in cinemas. It was suggested also that the subject should be studied by a joint committee consisting of members of the commission and representatives of the IES and the trade. This suggestion does not seem to have been followed up but in 1919 the London County Council asked the society for advice on possible causes of eye-strain in cinemas and a joint committee of the IES and the LCC, with Parsons as chairman, was set up to study the subject. This committee reported in 1920 and its recommendations were used subsequently by licensing authorities throughout the United Kingdom as the basis for regulations which have continued in force ever since.

With the recent introduction of wide screens and other new projection techniques, it was felt desirable to review these recommendations and a representative committee, under the chairmanship of W. J. Wellwood Ferguson, was set up by the IES in 1953. The report of this committee was published in the *Transactions* No. 7, 1956.

On the lighting of cinema auditoria the society in 1936 appointed a panel to make recommendations on the "maintained lighting"—i.e., the lighting left on during the showing of a film—and some three years' later Weston and E. Stroud presented a report summarising the panel's findings. In 1950 a report on safety lighting in auditoria—the result of work by another panel—was published in the *Transactions*.

Right : a typical office in the 1920s. Below : a modern office.

Lighting codes

Papers on the lighting of various types of interiors continued to be read at meetings of the society and development which had been interrupted by the war was resumed and extended. It is noteworthy that, as mentioned elsewhere, the first paper to be awarded the Leon Gaster Premium had for its subject "Domestic Lighting."

In 1936 the society published for the first time "Recommended Values of Illumination," containing extensive tables of the values considered appropriate for a number of different processes. This document, which occupied three pages of the *Transactions*, may be considered as the first edition of the IES Code, though it was not described as such by the society. It was re-issued, with amendments, in 1937 and 1938, and these versions together form the second edition. The third, rather more elaborate, edition appeared in 1941—still under the title of "Recommended Values." In 1942 the Code was adopted by the Ministry of Supply, the Admiralty and the Ministry of Aircraft Production in their application of the provisions of the Factories (Standards of Lighting) Regulations to the factories under their control.

The fourth edition of the Code was published in 1945. For the first time it was entitled the "IES Code of Practice for Good Lighting of Building Interiors" and it contained a number of new features, including an important section dealing with daylight, and recommendations concerning the quality of lighting, as distinct from values of illumination. The fifth edition, which did not differ greatly from the fourth, appeared in 1949.

Meanwhile, especially between 1934 and 1940, Weston had been carrying out a programme of research on the relationship between lighting and

visual efficiency. This work was inspired by Beuttell's paper on "An Analytical Basis for a Lighting Code," read before the society in 1933. In this paper Beuttell suggested that the values of illumination recommended for different visual tasks should be arrived at, not empirically as hitherto, but by an analysis of the task and an assessment of the extent to which its various features influenced the illumination needed for performing the task with comfort and efficiency. In 1943 Weston read before the society a paper entitled "Proposals for a new Lighting Code," in which he explained how the results of his experimental work could be used to prepare a code in which the values of illumination would be arrived at by an analysis of the task, as suggested by Beuttell.

Illumination and efficiency

His research had demonstrated that, for a task of given difficulty, as determined by its size, contrast and reflection factor, it was possible to draw a curve relating the illumination to efficiency—i.e., performance expressed as a percentage of the maximum possible, this maximum being the performance obtained when no further improvement resulted from increased illumination.

This proposal was a great advance for two principal reasons. Firstly, it now became possible to construct a table of values consistent among themselves, in the sense that for every task the illumination recommended was that giving the same efficiency of performance. Secondly, it provided an explanation and a logical justification for the continual increase in illumination values recommended in successive codes. The layman had not been slow to point to this increase and to express some doubt as to whether there was any good technical reason for it, asking "Where is the process likely to stop ?" The lighting engineer had, hitherto, been able to give only vague and somewhat unconvincing answers to this question until Weston provided him with the true explanation—that the relationship between increase of illumination and increase in efficiency obeyed, as might naturally be expected, the law of diminishing returns. When efficiency was low it could easily be raised by a moderate increase in ilumination, but when it was high a large increase was needed to bring about even a small improvement. From the strictly economic point of view, therefore, whether a given increase in illumination was worth while depended on the cost of providing it, compared with the economic value of the improvement in performance. It followed that the continuous and marked reduction in the cost of providing a given level of illumination was a good and sufficient reason for the adoption of higher values.

In fact, the provision of higher values of illumination became more and more widespread after the 1939-45 war and it was considered desirable to revise the IES Code thoroughly to bring its recommendations into line with current practice, while retaining task-analysis as the technical basis for the values given. This much revised and enlarged Code was issued in 1955 and in a paper read before the society in 1958 it was possible for H. H. Ballin to write "There is every indication that the higher levels in the IES Code are now widely accepted and adopted by factory managements."

Before the end of the war, the Building Research

Left : a typical school in 1909.
Below : a modern school hall

Board of DSIR had set up a committee whose terms of reference were, in essence, to examine all the available information on the lighting of buildings, both by natural and artificial light, and to make recommendations for installations in post-war buildings. Ten of the members of the committee, including the chairman, C. C. Paterson, were members of the IES and the society was among the seven technical organisations invited to give evidence.

In its first report, issued in 1944, the committee confined its study to dwellings and schools and included an interesting summary of a nation-wide survey of lighting conditions in the home. This survey indicated very clearly the need for more educational work, not only among the lay public, but also among the ranks of professional men concerned with the lighting of buildings, and the committee made suggestions on this subject at the end of its report.

Several detailed recommendations were made for the lighting of different parts of a house, mostly in terms of the amount of light to be provided rather than the level of illumination required. For schools, however, illumination values were stated.

A second report, issued in 1952, dealt with the lighting of offices. In this, the recommendations for artificial lighting were in terms of illumination levels, following generally the lines of the IES Code.

Current practice

It has been said that, today, the lighting engineer is less concerned with quantity than with quality. In other words, the provision of adequate illumination is now an easy matter compared with, for example, the avoidance of glare and the design of the visual field to produce a pleasing effect. Here again members of the IES have made notable contributions. Work on glare is referred to on p. 75, and a comprehensive paper on the design of the visual field was published in the society's *Transactions* in 1953. This led Waldram to develop his method of design in which the appearance of the visual field is first specified and, working back from this, the lighting engineer deduces the arrangement and lighting characteristics of the sources required. Originally described before the society in 1954, and again as part of the British contribution to the 1955 session of the International Commission on Illumination, the method was further elaborated in a paper published in the *Transactions* in 1958.

Even a cursory glance back over the last 50 years is sufficient to show how remarkable have been the advances in every field of interior lighting. In 1908 Trotter wrote "The foot-candle is a very convenient and comfortable illumination. It is for most people the best illumination for reading, and is to be found on most well-lighted dining room tables and billiard tables. More than 3 foot-candles is seldom attained in artificial illumination." The value of illumination recommended in the current edition of the IES Code for similar purposes is 15 lm/ft^2.

In other directions the advances have been almost equally spectacular. In 1909 the lighting engineer often found it difficult to provide what was considered adequate illumination, and such matters as glare received scant attention. The need to provide

Top: a modern factory compared with (below) a factory in 1915

some type of shield for naked lights is referred to over and over again in early papers and the society waged incessant warfare on glare in every form. The second and third meetings were devoted to a paper by Parsons on the subject and a pamphlet published by the society in 1913 gave emphasis to it by means of the slogan "Light on the object, not in the eye." Today, the lighting engineer regards it as axiomatic that bare sources should be properly enclosed, and the term "glare" is used in other connections—e.g., in discussing the effects produced by extreme brightness contrasts between the different areas in an illuminated interior.

Some words spoken by Paterson toward the end of his Guthrie lecture, given before the Physical Society in 1938, are worth quoting here. He said, "The illuminating engineer of yesterday was the candle power engineer of the day before. He is becoming the brightness engineer of today, but as soon as physics has provided suitable and understandable techniques for appraising contrasts he is surely fated tomorrow to become a contrast engineer."

No doubt the progress that has been recorded above has been made possible by the introduction of new sources of light of ever-increasing efficiency. It is, however, due in no small measure to the work and influence of the IES that full advantage has been taken of each new source to improve the general standard of interior lighting.

THE ROLE OF THE SOCIETY IN IMPROVING LIGHTING PRACTICE (*continued*)

Floodlighting—and lighting for sports

P. Good, President 1938-39

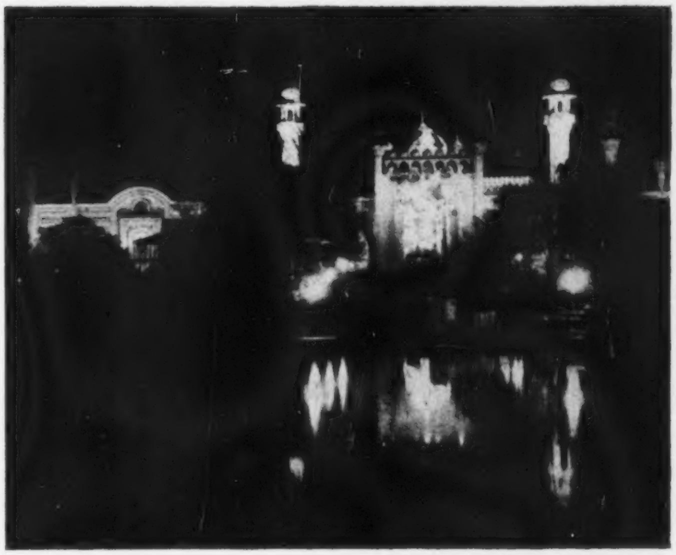
Before 1931 there was little floodlighting in the U.K., though several individual buildings had been floodlit from time to time—often as an advertisement, sometimes as a public amenity. Examples are illustrated in the book "Modern Electrical Illumination", by Sylvester and Ritchie, which was published in 1927 and contained a long chapter on the subject. After referring to the use of searchlights for lighting a target as an early example of floodlighting, the authors remark that its further development coincided with the advent of the high-power gas-filled lamp.

At a meeting of the society held in January, 1927, W. J. Jones, H. Lingard and T. Catten read a paper entitled "Floodlighting" and, although this paper was concerned mainly with principles and methods of design, pictures of a number of outstanding examples were shown and the main features of these examples were explained. One of the applications mentioned was the lighting of advertisement hoardings.

FOUR years later there was an occasion for a remarkable floodlighting display. In September, 1931, the International Commission on Illumination held its Eighth Session at Cambridge, preceded by an International Illumination Congress held in various cities throughout Gt. Britain. The joint committee of the IES and the British National Illumination Committee, which was responsible for the arrangements for the congress, approached the Office of Works, the principal manufacturers of lighting equipment and a number of other organisations and, as a result, many public and other buildings in London, Edinburgh and elsewhere were floodlit for the first time on the evening of September 1.

The results amazed even the organisers. Everywhere the streets were thronged with crowds so dense that in many places it was almost impossible for pedestrians to pass and the delegates to the congress, who had embarked in coaches for a tour of inspection in London, found themselves stranded for some time in Parliament Square. The display was continued for several weeks and every night vast crowds

Right : floodlighting at the Wembley Exhibition 1924. Below : Buckingham Palace



gazed at the spectacle of buildings revealed in an unfamiliar way. St. James's Park enjoyed a particularly artistic treatment, with the trees and bushes on the islands of its lake lit in a tasteful manner, gas being used for much of the lighting project.

These floodlighting schemes captured the public imagination and, true to its tradition of reflecting current reactions, *Punch* published at the time cartoons with floodlighting as their theme.

Steady progress

After 1931 the use of floodlighting for decorative or advertising purposes and, from time to time on public buildings, spread rapidly. Local celebrations were often marked by the floodlighting of some historic or especially beautiful building. Not until 1935, however, was there another occasion for a nation-wide display, this occasion being the silver jubilee of King George V. Then, in 1937, came the coronation of George VI—another event marked by what had by then become an indispensable feature of any national rejoicing.

The victory celebrations of 1946 gave rise to schemes of floodlighting on a scale never before attempted. Practically all the government offices in Whitehall and many other buildings, including Buckingham Palace, Westminster Abbey, St. Paul's Cathedral, Hampton Court Palace and Windsor Castle, were floodlit for the occasion. St. James's Park was the site of an elaborate installation, with several examples of colour sequences. Finally, there was a novel display on the River Thames with illuminated water jets and other features.

In 1950 Ackerley read a paper on floodlighting at the summer meeting of the IES (held in Buxton) and in this paper he mentioned some of the lessons that had been learnt while the technique was still in an experimental stage.

In 1951 the Festival of Britain provided a splendid opportunity for floodlighting on a grand scale which was utilised to the full, both in London and elsewhere. Two years later came the coronation of Queen Elizabeth II and the use of light as part of the festivities surpassed anything that had been attempted previously.

In a message printed in a special "coronation lighting" issue of *Light and Lighting*, the Minister of Works (then Sir David Eccles), wrote : "During the last twenty years or so since we in this country first showed the possibility of large-scale floodlighting, we have from time to time shown our abilities in the field of decorative outdoor illumination. The coronation provided not only another opportunity for us to show our skill but also a challenge to produce new decorative lighting effects : I feel that the engineers and designers concerned are to be congratulated on the results they achieved."

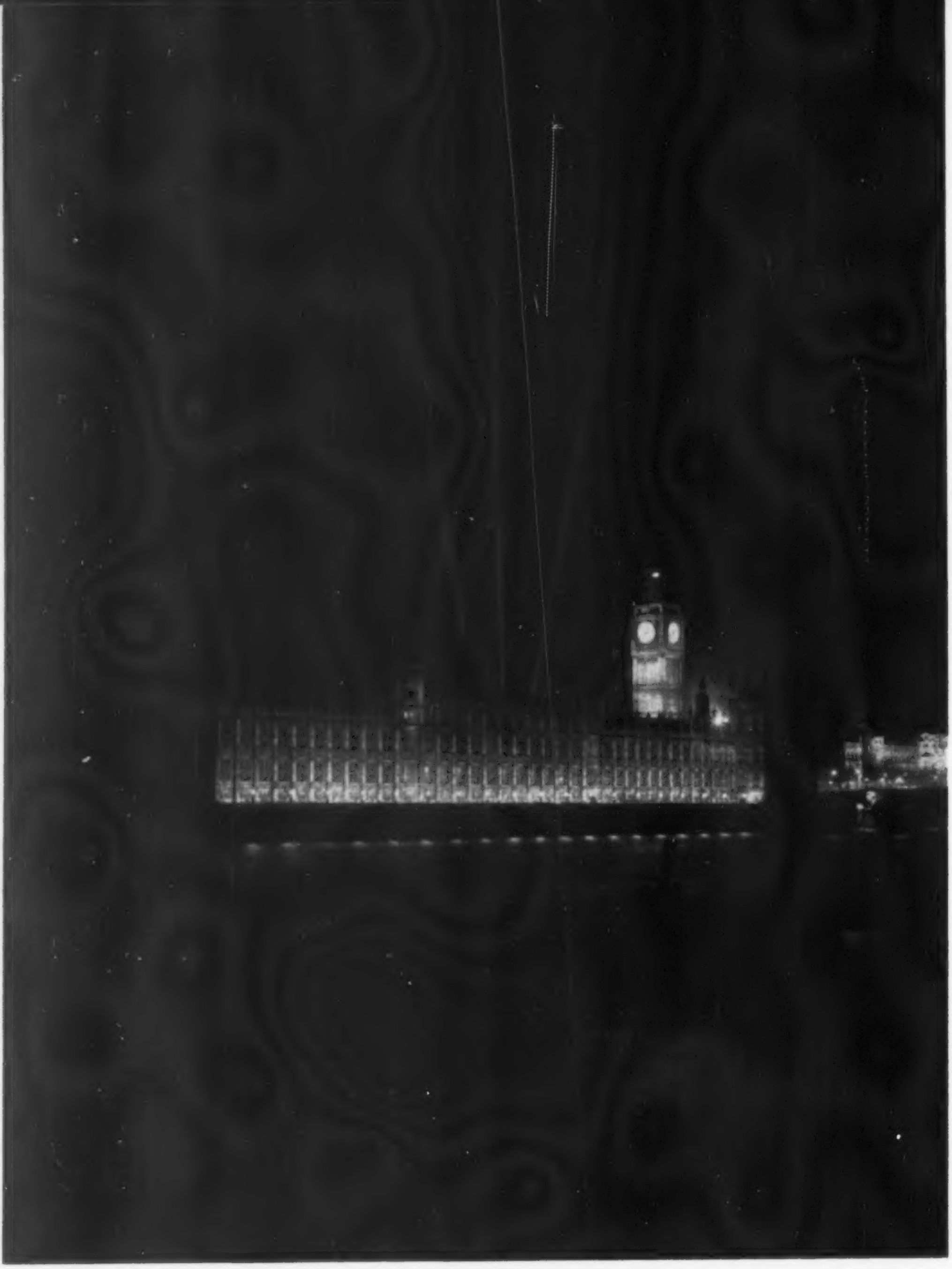
Son et Lumière

The combined light and sound spectacles (son et lumière) pioneered with such success in France some years ago, are now being arranged on a limited scale in Great Britain, though it is as yet too early to form any conclusion as to the popularity in this country of displays on which meteorological conditions have such a powerful influence. On the other hand, floodlighting has been used successfully on many occasions in connection with outdoor pageants and similar shows.

While it is true that much floodlighting still depends on the use of gas-filled lamps, as it did when Sylvester and Ritchie wrote their book, the advent of discharge lamps and, still later, the application of fluorescent lamps to floodlighting have made it possible for the lighting engineer to introduce much more variety into his schemes than was possible some 30 years ago.

Floodlighting for work and play

The more utilitarian applications of floodlighting were developed side by side with its use for decorative and advertising purposes. Sylvester and Ritchie refer to its increasing use in quarries and open-cast mines and for road repair work during the night.

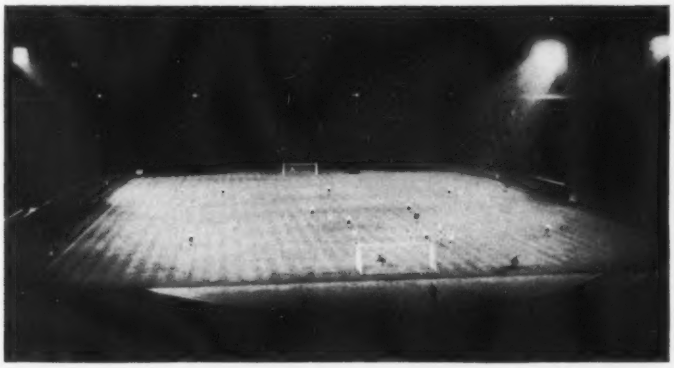


The Houses of Parliament

For a long time it has been employed extensively on large building sites and in dockyards.

An important use is for the lighting of railway goods yards. For many years most marshalling yards were lighted by fittings mounted at heights of 20 ft. or less, the system being in fact, an adaptation of street lighting practice. A. Cunnington, later president of the IES, referred to this subject at some length in a paper read at the International Illumination Congress in 1931. He carried out a number of experiments over a period of years and, in a paper with G. W. Golds read before the society in 1946, he suggested floodlighting from high steel masts to provide lighting with a diversity of not more than 5 to 1 and a minimum of about 0.075 lm/ft^2 over the main working area. Today, floodlighting from projectors mounted at heights of 50-60 ft. is a common practice and batteries of projectors mounted at heights of up to 100 ft. are sometimes used.

In the world of sport, floodlighting has been used for some time at race tracks and swimming baths. In a paper read before the society in 1953, M. W. Peirce referred to this subject and mentioned also the floodlighting of ice rinks and football grounds. This last application has given rise to a good deal of controversy. In America, baseball grounds were floodlit as early as 1930 but, although a football match was played in 1888 by the light of 10,000 oil



Left : Wembley Stadium

Centre : Wales Empire Pool, Cardiff

Below : lighting along the Mall at the Coronation 1953

lamps, the floodlighting of football grounds in the U.K. must be regarded as a recent development, probably not more than about 10 years old, and there has been considerable opposition to football matches played by artificial light. However, the practice now seems to be well on the way to general acceptance and a large installation was put into use at Wembley Stadium in 1955. In the February, 1954, issue of *Light and Lighting* an excellent account was published of some of the principal installations carried out before that date.

To answer the question " In what way did the IES influence the developments that have been described above ? " is not easy. It is certain that the great impetus of the 1931 displays was in no small measure due to the society, in association with the National Illumination Committee, and it was to a large extent the personal enthusiasm of a prominent member of the IES, Percy Good, and his influence in official, as well as in commercial circles (he was then Deputy Director of the British Standards Institution) that made possible this great demonstration of the potentialities of floodlighting. From that time onwards, development and growth in popularity seem to have been largely spontaneous and the society may, perhaps, look back with the satisfaction of a pioneer who feels that he shares in the successes of those who follow in his trail.

P. J. Waldram

THE ROLE OF THE SOCIETY IN IMPROVING LIGHTING PRACTICE (*continued*)

The natural lighting of buildings

Today, anyone interested in the natural lighting of buildings, be he an engineer, an architect, or a litigant in a " right of light " case, takes for granted the use of daylight factors to express the daylight level in a room. This factor, by the name of " window efficiency ", was in fact first suggested by Trotter in 1895 and later the idea was taken up and extensively used by P. J. Waldram—one of the founder members of the IES and a man who devoted much of his life to the study of daylight. In 1909 he published in *The Illuminating Engineer* the results of a number of measurements of daylight in various public buildings, including the Houses of Parliament and Charing Cross Station, and in December, 1913, he read a paper on the subject before the society. It was during the discussion on this paper (resumed at the following meeting) that he described a series of experiments carried out with W. C. Clinton at University College, London, to test the validity of the model method of studying the daylight conditions in proposed buildings.

WALDRAM made considerable use of the device, generally known as a " daylight attachment ", which was designed by Trotter for use with his illumination photometer. The instrument gave, in effect, a measure of the illumination due to a complete hemisphere of sky of uniform brightness equal to that of the particular region of the sky towards which the instrument was directed. He was responsible for introducing the term "grumble point" to denote any point in a room at which the daylight is found, by reasonable people, to be just insufficient for ordinary purposes. He demonstrated that generally the grumble point occurs at a daylight factor of about 0.2 per cent, so that on a plan of any room, the line through all the points at which the daylight factor has this value divides the room into two parts receiving, respectively, inadequate daylight and daylight which is either adequate or good. Another conception of Waldram's was the " no-sky line "—the line joining all the points in a room from which the sky is just not visible. In ordinary circumstances and in rooms of normal shape, the no-sky line was found usually to be very close to the line of 0.2 per cent daylight factor; it could, therefore, be used to give a rough idea of the daylight conditions in a room.

Natural lighting of schools and factories

In 1914 the society's Joint Committee on School Lighting, which had reported on the artificial lighting of schools the previous year, issued a report on daylight in schools, recommending a minimum daylight factor of 0.5 per cent in classrooms. Then in 1915 came the Report of the Departmental Committee on Factory Lighting (see p. 60) with its recommendations for certain values of minimum illumination, specifically stated to apply to daylight as well as to artificial light.

In the survey of lighting conditions in factories which accompanied the report as much attention was paid to natural as to artificial lighting, and the many individual daylight factors recorded give a good idea of the natural lighting in factories in 1913. As with artificial lighting, the frequency curves for daylight factors in different classes of factory premises present some interesting features. For instance, half the observed values on looms in weaving sheds were at or above 2.7 per cent, whereas at spinning mules the corresponding figure was less than 0.4 per cent.

In an appendix to this report, ascribed to Paterson and Walsh, there is an account of a lengthy series of measurements of daylight illumination values in the open, made at Teddington from April to December, 1914. Mean curves are given showing the illumination throughout the day in June, September and December. Other curves show the average illumination at midday for each month of the year and the way in which the illumination falls off from mid-day to sunset on two autumn days with very different meteorological

conditions. This survey, though on a modest scale compared with others to be referred to later, seems to have been much more extensive than any made before that time.

The Waldram diagram

Waldram continued his study of daylight after the publication of the 1913 paper, and in 1922 he acted as an expert witness in a right-of-light case (Semon *v.* Bradford Corporation) which, ever since, has been used as a precedent in such litigation. Measurements of daylight factor were accepted in evidence by the court in this case and they are now frequently used both by the courts and by arbitrators in deciding claims for compensation.

To facilitate the rather tedious calculations involved in determining the daylight factor at a number of points in a room, Waldram, in collaboration with his son J. M. Waldram, devised the familiar diagram to which their name was given. This diagram was described at a meeting of the society in 1923. It is still, today, one of the most widely used methods of predetermining daylight factors.

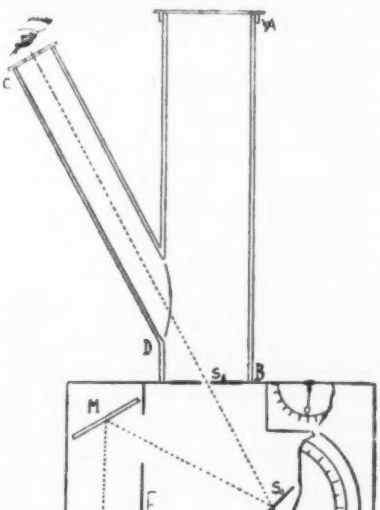
The Waldram diagram, together with much else concerning the natural lighting of buildings, was described in a paper prepared by Waldram and published in 1927 as No. 7 of the series of Technical Papers issued by the Illumination Research Committee of DSIR. This committee had already sponsored some investigations of natural lighting, and others, carried out at the National Physical Laboratory, were described in further Technical Papers published subsequently.

Daylight records

Measurements of daylight in the open were made regularly at Teddington three times a day from May, 1923, onwards, and diagrams showing the averages for each month were published yearly in the Annual Report of the NPL. In Technical Paper No. 17, entitled "Seasonal Variation of Daylight Illumination", the observations for the 10-year period 1923-33 were summarised in the form of a series of diagrams. All these observations were made with a visual photometer, but in 1930 a photo-electric recording photometer was installed and was described in a paper read before the IES in 1932. With this instrument it was possible to obtain continuous records of the illumination from daybreak to nightfall, instead of the thrice-daily visual observations, and in a paper read before the Illumination Section of the Building Research Congress in 1951 an analysis of the records obtained over the period 1933-39, was summarised in a series of tables.

Other research on daylight problems sponsored by the Illumination Research Committee included an investigation into the efficiency of interior light wells, a survey of the daylight requirements in clerical offices and an experimental determination of the daylight illumination required for clerical work.

The penetration of sunlight into buildings was another subject studied by Waldram, and part of Technical Paper No. 7 is devoted to a description of a method for determining the loss of sunlight due to given obstructions. Diagrams for computing the period during which sunlight enters a given room were devised by P. V. Burnett and an instrument for studying sunlight conditions by means of a model—the "Heliodon"—was designed by H. E. Beckett at BRS.



Trotter photometer with daylight attachment

Post-war recommendations

Natural lighting of buildings was studied in some detail by a committee of the Building Research Board which reported in 1944 (see p. 63). Several pages of the report are devoted to the principles governing the design of windows to give adequate daylight and there is a long section on the natural lighting of school classrooms. Much of the treatment is based on work done at BRS under the inspiration of members of the IES—in particular, Beckett and W. A. Allen, who also studied the effect of town planning on the availability of daylight in blocks of flats or offices. The report contains a number of recommendations on the provision of daylight in both dwellings and schools.

It was the work at BRS which resulted in the introduction of specially designed protractors for obtaining rapidly an estimate of the daylight factor which would be given by any proposed design of window, either in the roof or the walls of a building.

The IES Code of 1941 had a section giving recommendations for the provision of daylight and this section was included also in the 1945 and 1949 editions. In the current (1955) edition this section of the code has been completely rewritten and greatly extended.

Further research needed

The provision of good natural lighting in a building is primarily the responsibility of the architect, but there are difficult problems involved and further information is needed. For example, the simple daylight factor used by Waldram and others for many years is now insufficiently precise for certain problems in window design. Similarly, the Waldram diagram, based on the assumption of a sky of uniform brightness, may give misleading results in certain circum-

Above : a modern office building. Below : Government offices in Whitehall 1908

stances, and a modification of this diagram, based on a closer approximation to the brightness distribution of an overcast sky, has recently been introduced.

In his presidential address to the society in 1951, J. G. Holmes stressed the need for more research on daylight and drew attention to those aspects of the subject on which more information was needed. In particular, he pointed out that diffusing glass was used extensively both for the control of light and to prevent a clear view through a window, yet there was little quantitative information either on the diffusing power or on the obscuring power of such glass. He referred also to the use of prismatic glass for increasing the illumination at the back of a room with a much obstructed outlook.

Picture galleries

There is one special field of natural lighting which has received a good deal of attention from time to

time—the lighting of picture galleries. With normal roof-lights it is impossible to avoid disturbing reflections in the glazing or the varnished surfaces of the pictures. In 1923, experiments were carried out at NPL in connection with the design of a new wing at the Tate Gallery. The experiments were made on a scale model, part of which—gallery XVII—was provided with a form of side-roof lighting which gave much better results than the normal arrangement. The work was described in Technical Paper No. 6 of the Illumination Research Committee.

Fifty years of advance

It is not easy to compare the natural lighting of buildings today with that prevailing 50 years ago, but for schools a direct comparison is possible. Today the Ministry of Education demands a minimum daylight factor of 2 per cent in all classrooms of new schools, while the minima observed in 1908 were from 0.1 to 0.25 per cent and in 1914 the value recommended by the society's Committee on School Lighting was, as mentioned earlier, 0.5 per cent.

Similar statistical proof is hardly needed to support the statement that natural lighting in new office buildings is far superior to that provided in offices built during the early years of the century. Indeed, it would be interesting to know how many offices in use fifty years ago would have satisfied the recommendation in the second report of the Lighting Committee of the Building Research Board—that the daylight factor in a side-lit office should be at least 1 per cent for a depth of 10 or 11 ft. from the window wall.

THE ROLE OF MEMBERS OF THE SOCIETY IN RESEARCH AND DEVELOPMENT WORK

The I.E.S. and lighting research

Several of the founders of the IES, e.g. Trotter, Parsons, Paterson and Dow, were men who had already carried out noteworthy research into subjects within the society's field of interest. Moreover, it was the research leading to improvements in light sources that made possible the work of the lighting engineer and its development as a specific branch of technology. From the first, therefore, the society welcomed to membership research workers in such fields as vision, photometry and street lighting.

NOT until 1914, however, was any active step taken by the society as a whole to stimulate research. In that year, a special committee of 15 was appointed, with Prof. Silvanus Thompson as chairman, to advise on the research required and the way in which the society could foster it. Unfortunately the committee's activities were delayed by the outbreak of war, but it reported to the annual general meeting of the society in May, 1916, and, as a first step, listed 30 subjects " specially deserving of research at the hands of the society ". Among these were the development of a standard of light; heterochromatic photometry; a scientific study of lighting glassware; and an investigation into glare or, more specifically, the considerations determining permissible limits of luminance (termed " intrinsic brilliancy " in the report).

Approaches to DSIR

In December, 1916, DSIR was established and very soon afterwards, in March, 1917, a deputation from the society waited on the chairman of the Advisory Council to urge the formation of a joint committee on lighting engineering. The deputation consisted of seven members, led by Sir Wm. Bennett, the president, and Trotter, the senior vice-president.

The result was the appointment in April of a joint committee operating under DSIR, with Trotter as chairman and nine other members. The first meeting was held almost immediately and one of the matters considered to need early investigation was lighting glassware. The committee still existed in 1919 but after that year there is no more mention of it and, as Trotter moved into the country in 1920, it may be presumed that it was allowed to lapse.

In 1923 a new committee was

formed, with Paterson as chairman and nine other members, four of them from the IES—Gaster, Parsons, Walsh and Wilson. At the January meeting of the society in 1924, Dow read a paper on the "Co-ordination of Research in Illumination", in which he gave a survey of the problems into which research was required, and said that some of these problems could best be studied at colleges or at government establishments, while others could be dealt with more appropriately by industry.

By the end of 1926 the Illumination Research Committee had published four "Technical Papers". The first, appropriately enough, was entitled "The Terminology of Illumination and Vision"—a title which sufficiently indicates the nature of the contents. The second,

A. W. Beuttell, President 1935-36

third and fourth papers described work respectively on the transmission factor of commercial window glasses; on the light distribution from what is now called a standard dispersive reflector, and on the luminance of diffusing glassware fittings. All this research was carried out at the National Physical Laboratory.

Lighting and efficiency

Meanwhile, the committee collaborated with the Industrial Fatigue Research Board of the Medical Research Council in sponsoring an investigation into the relationship between lighting and efficiency in the performance of fine work, the process selected for the purpose being typesetting by hand. The result was a report by Weston and Taylor, which was published in 1926, this report being followed two years later by a further report by these two members—on an investigation into the effect of the system of lighting on the performance of the task.

Daylight calculations

The work of the committee was discussed at a meeting of the society held in June, 1926. The membership changed slightly from time to time and P. J. Waldram joined it in 1927. He was responsible for Technical Paper No. 7, published in 1927, which dealt with daylight and sunlight problems, including the calculation of daylight factors by means of the Waldram diagram, the effect of reflection from whitened obstructions facing a window and the loss of sunlight due to such obstructions. A second edition was published in 1932 but meanwhile there had been several other papers dealing with natural lighting, giving the results of research carried out under the aegis of the committee. (For examples see pp. 71 and 73.)

Street lighting

Another branch of lighting engineering that received the committee's attention was street lighting. A study of the reflection characteristics of different types of road surface was described in Technical Paper No. 9, while No. 13 comprised an account of full-scale experiments on a number of streets in Leicester. These experiments were carried out in September, 1930, when the Association of Public Lighting Engineers held its annual meeting in that city and members of the association acted as observers. The investigation was conducted by two members of the society—W. S. Stiles and C. Dunbar—the former having previously made, at the committee's request, a detailed study of the effect of glare on the ability of the eye to detect small brightness contrasts. Later, Stiles and Dunbar collaborated in a lengthy programme of research which led to an analysis of the problem of glare from motor-car headlights and a method for its evaluation. This research was described in Technical Paper No. 16.

Headlamps and fog

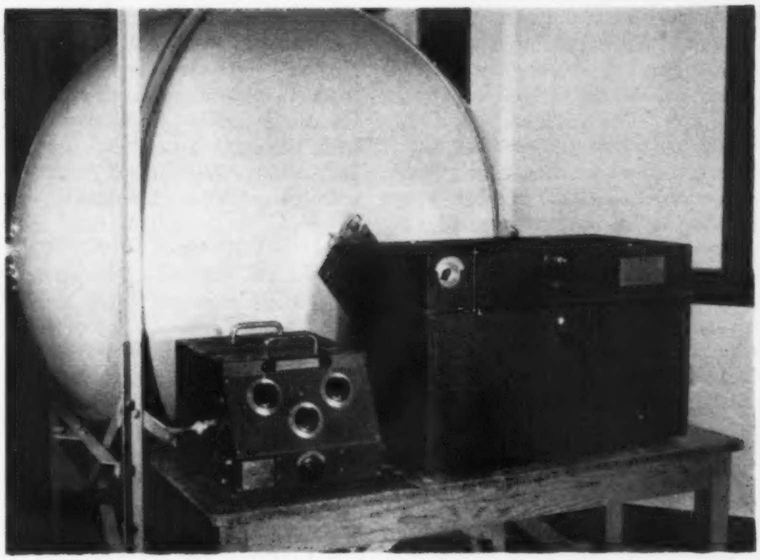
Another investigation carried out under the auspices of the committee was a comparison of the revealing powers of white and coloured headlight beams in fog. An account of this work was published by Stiles in *The Illuminating Engineer* for April, 1935. Later, Dunbar carried out a series of experiments on the effect of the colour of the illuminant on the revealing power of a street-lighting installation. These experiments were completed just before the beginning of the war and an account of them appeared in the *Transactions* for 1939. The Illumination Research Committee was not revived after the war.

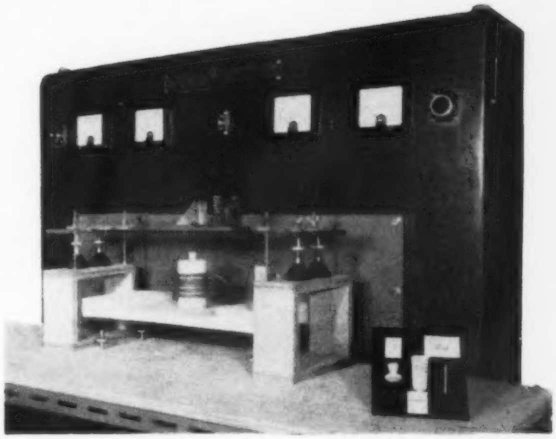
Work at NPL

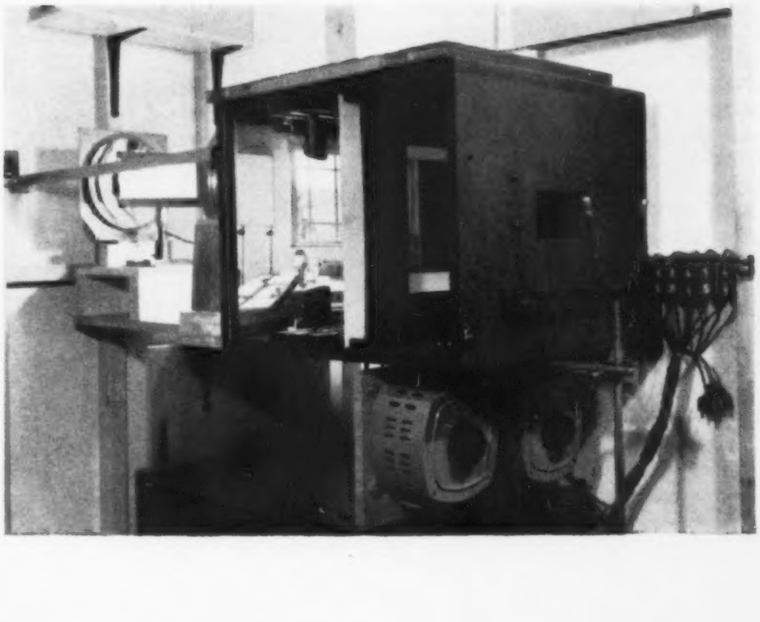
Weston's research into the relation between lighting and visual efficiency are referred to elsewhere as providing a basis for a lighting code in which the recommended values of illumination are arrived at by task analysis rather than empirically (see page 61). The work was sponsored jointly by the Industrial Health Research Board of the Medical Research Council and by the Illumination Research Committee. It was carried out at the National Physical Laboratory in two stages. The first stage was confined to a study of the effect of size of detail and a report on this aspect of the subject was published in 1935. The second stage—on the effect of contrast—was not completed until after the outbreak of war and, in fact, the report did not appear until 1945, when the Illumination Research Committee had been dissolved and its work on visual problems had been taken over by a committee of the IES—the Physiological Committee—comprising 12 members, with Prof. H. H. Hartridge as chairman.

Post-war research

It will have been noticed that among the investigations for which the Illumination Research Commit-







Top right : apparatus designed for research in photometry and colorimetry

Centre : the primary standard of light at the NPL

Bottom : apparatus used for research on glare at the BRS

tee was responsible, daylight, glare, and lighting for traffic (including both street lighting and vehicle lighting) figured prominently. After the war the research on daylight was continued at BRS. The development of a series of protractors for the ready determination of daylight factors is mentioned elsewhere (see p. 71). These protractors were extensively used at BRS itself in investigations concerned with the design of new buildings—especially schools, factories and hospitals. Much use was made, too, of small-scale models, and among the investigations carried out by this method was an appraisal of a new natural lighting system for the National Gallery. The method was also used for a study of roof lighting for the Birmingham Art Gallery.

Reflections

Among the difficulties which attend any method of designing for daylight is the effect of reflections from internal surfaces. The problem is in some ways analogous to that met with in the artificial lighting of interiors, and a great deal of research has been devoted to it at BRS and elsewhere. R. G. Hopkinson, J. Longmore and P. Petherbridge treated the matter at some length in a paper entitled "An Empirical Formula for the Computation of the Indirect Component of Daylight Factor", which was published in the *Transactions* in 1954. This paper followed a survey of the problem by A. Dresler which had appeared, also in the *Transactions*, a few months earlier.

Glare assessment

The subject of glare has been studied intensively during the past decade, particularly by Petherbridge and Hopkinson, again at BRS. As early as 1940 Hopkinson, in a study of discomfort glare in street lighting,

had used the so-called "multiple criterion" technique for obtaining, from a panel of observers, a usable assessment of the degree of glare they experienced under any given set of lighting conditions. As the conditions, taken one at a time, were gradually altered, each observer was asked to say at what point he found the glare satisfied one of the criteria "just imperceptible", "just acceptable", "just uncomfortable" and "just intolerable". The same technique was used later in an extensive study of glare in interior lighting, the results of which were given in a paper read before the society in January, 1950. A further paper by the same authors, dealing with the problem of reflected glare, was published in the *Transactions* for 1955.

Street lighting and safety

Research into the problems of traffic lighting was continued at the Road Research Laboratory of DSIR. As before, research on various factors affecting the performance of a street lighting system and on motor-car headlights was carried out. Accounts of this work have been published from time to time in the *Transactions* of the society. In particular, A. J. Harris and V. J. Jehu have contributed a number of papers on "meeting beams" from headlights designed to reduce glare to oncoming drivers, while Jehu has examined the possibilities of polarised headlight systems. In a paper read before the society in March, 1957, Harris discussed the problem of measuring visibility in a street lighting installation and concluded that, while it was not possible to represent this by a single number, it *was* possible to compare installations in terms of safety. Much research has been carried out recently at the RRL on the relationship between street lighting and accident rate and articles by members of the staff of that laboratory have appeared in *Light and Lighting*, the latest being as recently as November, 1958.

Photometry and colorimetry

The measurement of light has naturally been a subject of major interest to the society from the time of its foundation. Trotter was associated with Preece in the design of the first illumination photometer. He and Haydn Harrison were pioneers in the design of photometers for use in street-lighting work and from time to time new portable instruments were described at the society's meetings. Photometric work at NPL was carried out under Paterson, followed in 1919 by Walsh and H. Buckley, all of whom were one-time presidents of the society. The first specialised section of the society was the Photometric Section and at an early meeting of that section a paper by J. Guild on the relationship between photometry and colorimetry was read and discussed. Guild and W. D. Wright, later to become an active member of the society, made the measurements used by the International Commission on Illumination in 1931 for the purpose of establishing the standard observer for colorimetry. A second and more elaborate series of such measurements is now being made at NPL by Stiles.

It will have been noticed that most of the research mentioned so far has been that carried out in government laboratories, but side by side with this work there has been a vast amount of research sponsored by the lighting industry. Not all of this work has been described in publications, but even a cursory examination of the society's *Transactions* will show that industrial laboratories make a substantial contribution to lighting research. Apart from research into the many problems connected with the development of light sources, there has been work on such fundamental matters as heterochromatic photometry and colorimetry, particularly by G. T. Winch and his co-workers, and on lighting applications, notably street lighting, where the work of G. H. Wilson, H. R. Ruff, J. M. Waldram and others calls for special mention (see p. 57). The colour rendering of light sources, in particular fluorescent lamps, and colour adaptation effects in vision are related matters which have been the subject of a great deal of research.

Research is the life-blood of any technology, and this is especially true of lighting. Realising this, the IES has revived recently its Technical Committee and given it several tasks, the most important of which is "to initiate studies, to present reports and to prepare technical publications . . ." It is the avowed intention of the committee "to make suggestions for subjects of research on lighting and allied subjects at universities and technical colleges", so it is clear that the society today is as "research-minded" as were its founders 50 years ago.

Part of a model used to check brightness patterns in a proposed installation.

SUSTAINING MEMBERS OF THE ILLUMINATING ENGINEERING SOCIETY

The IES has played a major part in the development of better lighting. The following is a list of companies and organisations who show their appreciation of the work of the IES by being Sustaining Members of the Society.

A.E.I. Lamp and Lighting Co. Ltd.
Aladdin Lighting Ltd.
Allom Brothers Ltd.
Arrow Plastics Ltd.
Atlas Lighting Ltd.
Aurora Lamps Ltd.
Barlow and Young Ltd.
T. Beadle and Co. Ltd.
T. Beadle Export Co. Ltd.
Benjamin Electric Ltd.
City of Birmingham Education Department.
Bolton Corporation Lighting Department.
British Electrical Development Association.
British General Electric Co. (Pty.) Ltd., Johannesburg.
British Luma Co-operative Electric Lamp Society Ltd.
British Optical Association.
British Thomson-Houston Co. (S.A.) (Pty) Ltd., Johannesburg.
Cartwright, J. T. and Sons, Ltd.
Chance Bros. and Co. Ltd.
The Cinematograph Exhibitors' Association of Great Britain and Ireland.
Claude Neon Lights of New Zealand Ltd.
E. Clegg and Sons Ltd.
Courtney, Pope (Electrical) Ltd.
Crompton Parkinson Ltd.
R. and A. G. Crossland Ltd.
Cryselco Ltd.
George Davidson and Co. Ltd.
Hubert Davies and Co. Ltd., Johannesburg.
Dernier & Hamlyn Ltd.
Docker Bros.
Dominec (Pty.) Ltd., Johannesburg.
Dorman and Smith Ltd.
Downes and Davies Ltd.
Eastern Electricity Board.
Eastern Gas Board.
East Midlands Electricity Board.
Corporation of the City and Royal Burgh of Edinburgh.
E.G.S. Company Ltd.
Ekco-Ensign Electric Ltd.
Electric Lamp Industry Council.
Electric Street Lighting Apparatus Co. Ltd.
Electrical Components Ltd.
The Electricity Council.
George Ellison Ltd.
Engineering and Lighting Equipment Co. Ltd.
Engineering Service Installations Ltd.
Erinoid Ltd.
Evans Electroselenium Ltd.
The Ever Ready Co. (Great Britain) Ltd.
Falk, Stadelmann and Co. Ltd.
Falks Electrical Supplies (S.A.) (Pty.) Ltd., Johannesburg.
H. W. Field and Son Ltd.
Foster Electrical Supplies Ltd.
B. French Ltd.
Fulford Brown Bros. (1929) Ltd.
Gas Council.
General Electric Co. Ltd.
G.P.O. (Engineering Department).
Girdlestone and Co. Ltd.
Donald Grant and Sons Ltd.
Hailwood and Ackroyd Ltd.
Harris & Sheldon (Electrical) Ltd.
Heyes and Co. Ltd.
S. H. Heywood and Co. Ltd.
Hirst, Ibbetson and Taylor Ltd.
Hivac Ltd.
Holland House Electrical Co. Ltd.
Holophane Ltd.
Hume, Atkins and Co. Ltd.
Imperial Chemical Industries Ltd. (Alkali Division).
Imperial Chemical Industries Ltd. (Metals Division).
Imperial Chemical Industries Ltd. (Paints Division).
Imperial Chemical Industries Ltd. (Plastics Division).
Inductive Appliances Ltd.
J. A. Jobling and Co. Ltd.
A. G. Jorgensen (1956) (Pty.) Ltd.
James Kilpatrick and Son Ltd.
Knightshades Ltd.
Lancashire Dynamo Electronic Products Ltd.
Leeds Education Committee.
Linolite Ltd.
Littlewoods Pools, Central Maintenance Department.
Corporation of Liverpool.
London Electricity Board.
London Typographical Designers Ltd.
Joseph Lucas Ltd.
Lumenated Ceilings Ltd.
Luxram Electric Ltd.
Marryat and Place Ltd.
Merchant Adventurers Ltd.
Merseyside and North Wales Electricity Board.
Metallic Seamless Tube Co. Ltd.
Metropolitan-Vickers (S.A.) (Pty.) Ltd., Johannesburg.
Midland Electric Installation Co.
Midlands Electricity Board.
Morgan Crucible Co. Ltd.
Mortimer Gall and Co. Ltd.
Neon Fluorescent (S.A.) Ltd., Johannesburg.
Nettle Accessories Ltd.
New Era Lighting Industries (Pty.) Ltd., Johannesburg.
Newey and Eyre Ltd.
North-Eastern Electricity Board.
North-Western Electricity Board.
North-Western Gas Board (Liverpool Group).
Oldham Corporation Street Lighting Dept.
Oldham and Son Ltd.
Philips Electrical Ltd.
S. A. Philips (Pty.) Ltd., Johannesburg.
F. H. Pride Ltd.
Prudential Assurance Co. Ltd.
Albert E. Reed and Co. Ltd.
Revo Electric Co. Ltd.
Fred Reynolds Ltd.
John Riley and Son (Electrical) Ltd.
J. Rivlin Ltd.
Robinson, King and British Challenge Glazing Co. Ltd.
Rogers, G. S. (Pty.) Ltd., Johannesburg.
Rowlands Electrical Accessories Ltd.
Satchwell and Gittings Ltd.
James Scott and Co. Ltd.
Siemens Edison Swan Ltd.
Siemens Edison Swan (Pty) Ltd., Johannesburg.
Sign Components Ltd.
Simplex Electric Co. Ltd.
S.L.R. Electric Ltd.
Herman Smith Smithlite Ltd.
Wm. Allan Smith and Co. Ltd.
W. H. Smith and Co. (Electrical Engineers) Ltd.
J. G. Sneath Ltd.
South-Eastern Electricity Board.
South of Scotland Electricity Board.
South Wales Electrictiy Board.
South-Western Electricity Board.
Southern Electricity Board.
Stella Lamp Co. Ltd.
Strand Electric and Engineering Co. Ltd.
Borough of Stretford.
Strong Electric Corporation (Great Britain) Ltd.
Superconcrete Pipes (S.A.) Ltd., Johannesburg.
Thermo-Plastics Ltd.
Thorn Electrical Industries (S.A.) Pty. Ltd., Johannesburg.
F. W. Thorpe Ltd.
Troughton and Young Ltd.
Tucker and Edgar Ltd.
Verity's Ltd.
Walsall Conduits Ltd.
J. Walton (Electrical) Ltd.
Wardle Engineering Co. Ltd.
J. M. Webber and Co. Ltd.
Whitworth Electric Lamp Co. Ltd.
Wokingham Plastics Ltd.
A. J. Wright (Electrical) Ltd.
Yorkshire Electricity Board.

Educating the public—and the professions

Every cultural and every technical society has, as one of its objects, the education of its members. In many instances it endeavours also to teach those outside its own circle about the subject with which it is principally concerned. The IES is a good example, for its aims, as restated in the Articles adopted in 1929, are "to promote the general advancement of illuminating engineering and the utilisation of natural and artificial light and the dissemination of knowledge relating thereto. . . ." The society's motto, "To spread light everywhere," may be read literally, or it may be taken figuratively to signify the spread of a knowledge of lighting principles and practice far and wide.

SINCE its formation the society has been actively engaged in carrying out these aims. Early in 1910 the first president, Silvanus Thompson, gave a series of lectures at the Royal Institution on " Illumination, Natural and Artificial," while in 1911 Dow lectured on the subject of illumination at the Westminster Technical Institute. In the same year lectures were given by members of the society at three London polytechnics, and early in 1912 a course of advanced lectures on lighting was delivered at University College, London, by W. C. Clinton. In the winter of 1912-13 a second series of 12 lectures was given by members of the society at The Polytechnic, Regent Street.

It will be seen that, during its first few years, the society's efforts at spreading the light of knowledge were confined more or less to audiences already interested in technical matters, but in the winter of 1912-13 a pamphlet was prepared for general distribution. Entitled " Light and Illumination: Use and Misuse ", it expounded the fundamental principles of vision and lighting in simple language.

This early venture into education by the written rather than the spoken word was followed later by a much more ambitious undertaking. In 1915 a book of nearly 500 pages was published for the information of those who wished to go thoroughly into the subject. This was " Modern Illuminants and Illuminating Engineering ", by Gaster and Dow (see p. 42). Five years later the same authors wrote a much smaller book entitled " Electric Lighting in the Home ", which was published at 6d. and intended for a much wider public. They followed this in 1921 with a book of similar size entitled " Electric Lighting in Factories and Workshops ". Then, in the same year, Trotter, whose earlier book (see p. 40) had been mainly for the student, published a small volume called " The Elements of Illuminating Engineering ", while two years later Walsh's first book, " The Elementary Principles of Lighting and Photometry " appeared. His more specialised book "Photometry" was first published in 1926.

In 1927, C. Sylvester and T. E. Ritchie published an authoritative and lavishly illustrated book entitled " Modern Electrical Illumination ", while three years later L. B. W. Jolley, J. M. Waldram and G. H. Wilson completed their compendious work of over 700 pages on " The Theory and Design of Illuminating Engineering Equipment ". In 1936 and 1937 Dow wrote a series of articles for *The Illuminating Engineer*, explaining in simple language the part played by lighting in the life and work of the community. These articles were republished in book form in 1939 with the title " Light in Daily Life ".

The Faraday Lecture on " Illumination and Light " given in 1926 by Trotter (see p. 44) was an outstanding example of an activity undertaken at this time by a number of members of the IES—*i.e.* the presentation of a paper on a subject connected with lighting to another technical or scientific society. For instance, Gaster gave a paper at the Optical Convention in 1926, and in the following year two papers on lighting were read before the IEE by members of the society, while Walsh delivered three Cantor Lectures on " The Measurement of Light " to the Royal Society of Arts. In 1931 he gave three Friday evening lectures at the Royal Institution and the following year collaborated with A. B. Read in a paper given before the IEE.

Exhibitions

Another way in which the IES has helped to spread knowledge of lighting matters is by giving advice and assistance in the arrangement of exhibitions. In 1927 the Home Office opened in Horseferry Road a permanent exhibition designed to promote the use of safety devices in factories. An extensive series of demonstrations of the principles of good lighting, of the effects of glare and of inadequate illumination, was arranged in the basement of the building and members of the society helped greatly with the provision and display of the exhibits.

A much more ambitious project was the Electric Illumination exhibition staged at the Science Museum in December, 1936. This exhibition, opened by Lord Rutherford, occupied a large area of the museum building and, besides showing the development of electric lighting, included exhibits illustrating some of the phenomena of vision and the

techniques of lighting engineering. Visitors to the exhibition could purchase a booklet giving an account, in fairly simple language, of " the principles, applications and development of electric lighting ".

This exhibition was followed some 12 years later by another, even more ambitious, entitled Darkness into Daylight and described as " an exhibition to mark 100 years of research and achievement in electric lighting ", the reference being to Swan's pioneering work on the carbon filament, carried out in 1848 and subsequent years. The exhibits were arranged to show the history of light sources from prehistoric times to the present day and the development of lighting. Much of the preparatory work was done and many of the exhibits were supplied by members of the IES. Again, there was a handbook which enabled the interested visitor to learn more about the mysteries of the electric lamp and introduced him to some of its less familiar applications. The exhibition was visited by King George VI and many thousands passed through the turnstiles during the five months for which it was open.

In 1950, the IES arranged a lighting exhibition for the meeting of the International Congress of Ophthalmology which was held in London in July of that year.

Training

So far the emphasis had been on the dissemination of knowledge among those outside the society and nothing had been said about education for a career in lighting engineering. This important part of the society's educational work was not forgotten and, in fact, C. E. Greenslade and J. E. S. White read a paper on the subject before the society in January, 1923, but nothing concrete was done until the session of 1935-36. At first it was suggested that the society should itself conduct an



Top left: R. O. Ackerley, President 1942-43. Top right: J. N. Aldington, President 1949-50

Centre: H.M. King George VI at the "Darkness into Daylight" exhibition, 1948

Lower left: L. J. Davies, President 1950-51. Lower right: W. R. Stevens, President 1953-54

examination and award certificates to successful candidates. Wiser counsels, however, prevailed. It soon became apparent that the organisation of a technological examination of this kind could be far better carried out by a body which specialised in such work than by a mainly cultural society. The appropiate body was, clearly, the City and Guilds of London Institute, and in 1937 the society approached that institute in the matter. An advisory committee was set up, with strong representation of the society, and a syllabus was prepared. Courses of preparation were started at several technical colleges and in 1939 the first examination (at the "Intermediate" level) was held. Since then the examination has been held annually without a break and the syllabus has been revised from time to time to keep pace with progress in a rapidly developing technology.

A logical complement to the establishment of an examination in lighting engineering was the provision of classes by means of which students could undertake the necessary preparation, and in the autumn of 1938 courses were arranged at several polytechnics and technical colleges, both in London and elsewhere. Since that time there has been a good deal of fluctuation in the number of courses available to students, and those living outside the London area have often had difficulty in finding such courses, though in a few of the larger cities, such as Manchester and Glasgow, classes have been arranged from time to time when the number of students has been large enough. In an attempt to meet this difficulty the society co-operated with a private correspondence college in the preparation of courses of study for both the intermediate and final grade examinations. It also encouraged the preparation of a textbook which was written by Walsh and published in 1946.

It may be mentioned here that in 1953 the IEE made lighting engineering one of the eight special subjects that students of that institution may take in the final part of the examination for graduateship. The IEE syllabus is similar in content to that of the City and Guilds examination at the intermediate level.

Lectures

It must not be concluded from the above account of the society's work in connection with exhibitions and training schemes, that all its other educational activities were suspended. On the contrary, lectures were given from time to time and books continued to appear. Especially noteworthy are two courses of lectures given at The Polytechnic, Regent Street. The first of these courses, consisting of 12 lectures by different members of the society, was given in April and May, 1925, while the second, ten years later, consisted of 10 lectures which were afterwards published as a book under the title "A Symposium on Illumination".

The year 1943 saw the start of lectures of quite a different kind—the lectures to school-children. In December of that year Ackerley and W. R. Stevens went to Bradford with a load of demonstration apparatus and gave six lectures on the elementary facts of light sources, vision and lighting to an audience consisting on each occasion of some 200 children from secondary schools. The success of this experiment was so great that the lectures have now become established as a valuable part of the society's educational programme. There are sets of slides and demonstration kit available for the lecturers—members of the society who combine an enthusiasm for lighting with a flair for exposition to a juvenile audience.

It is appropriate here to mention two meetings held jointly with the Science Masters' Association, one in 1944 and the other in 1946. On the former occasion six members of the society gave brief lecture-demonstrations suited to senior forms in secondary schools, while in 1946 Stevens gave a specimen lecture which he had compiled with S. S. Beggs. Entitled "Light and Your Eyes", it reviewed 50 years of progress in artificial lighting and was delivered in a manner likely to appeal to young people.

In 1948, Weston read a paper on industrial lighting at a conference on Human Factors in Industry, arranged by the British Association for the Advancement of Science, while in 1949 and 1950, J. N. Aldington gave a series of very successful lectures in different towns, chiefly in the north of England. His theme was, in essence, that of the "Darkness into Daylight" exhibition in London, and the lectures, which were open to the public, attracted audiences ranging from 1,600 to 3,000 people. This success was followed by an invitation from the British Medical Association to address their annual conference in the summer of 1950. Two years previously Weston, then hon. secretary of the society, had given the Ettles Memorial Lecture before the Association of Optical Practitioners. This lecture commemorated Dr. W. J. W. Ettles, an ophthalmic surgeon who had joined the IES very soon after its formation.

In 1951 L. J. Davies, who had succeeded Aldington as president of the society, gave the IEE's Faraday lecture and chose as his subject "Lamps and Lighting—a Record of Industrial Research". The scale and reputation of the Faraday Lecture had grown steadily from year to year and the lecture by Davies was correspondingly more elaborate and the total audience much larger than when Trotter gave the second Faraday Lecture some 25 years previously.

Post-war publications

Education by the written word, too, was not neglected. At the close of the war—in 1944 and 1945—the society prepared and distributed in large numbers a series of booklets called "Reconstruction Pamphlets". These booklets described, as far as possible in non-technical language

and with a wealth of illustration, what was then regarded as the best practice in lighting for various purposes — e.g. school lighting, street lighting and the lighting of public buildings. By far the most popular was the one dealing with factory lighting. This, entitled "Making Work Lighter", had the great asset of a number of illustrations drawn by "Fougasse" in his inimitable style and presented by him to the society.

In 1949 Weston published "Sight, Light and Efficiency", in which he marshalled the facts concerning the part played by seeing (which may be defined as a partnership of sight and light) in the efficient performance of a wide variety of visual tasks. Three years later came two more important books — "The Principles of Lighting", by Stevens, and Waldram's authoritative treatise on "Street Lighting". Meanwhile, H. Cotton had brought out a book for university students on "Electric Discharge Lamps", while H. Hewitt, who had been responsible for courses on lighting engineering in Manchester, published "Modern Lighting Technique"—another book of value to students preparing for the City and Guilds examination. In 1956 Walsh wrote a semi-popular book called "Planned Artificial Lighting".

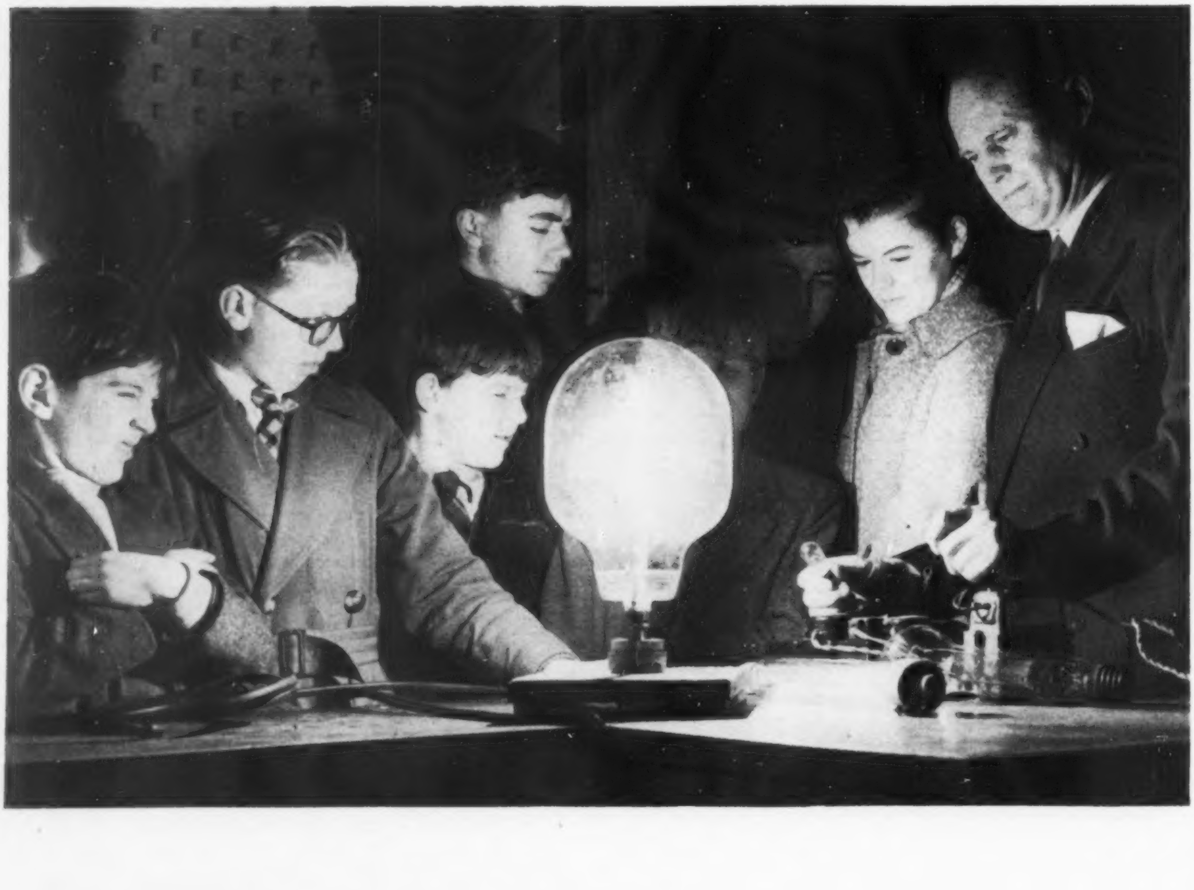
Other educational activities

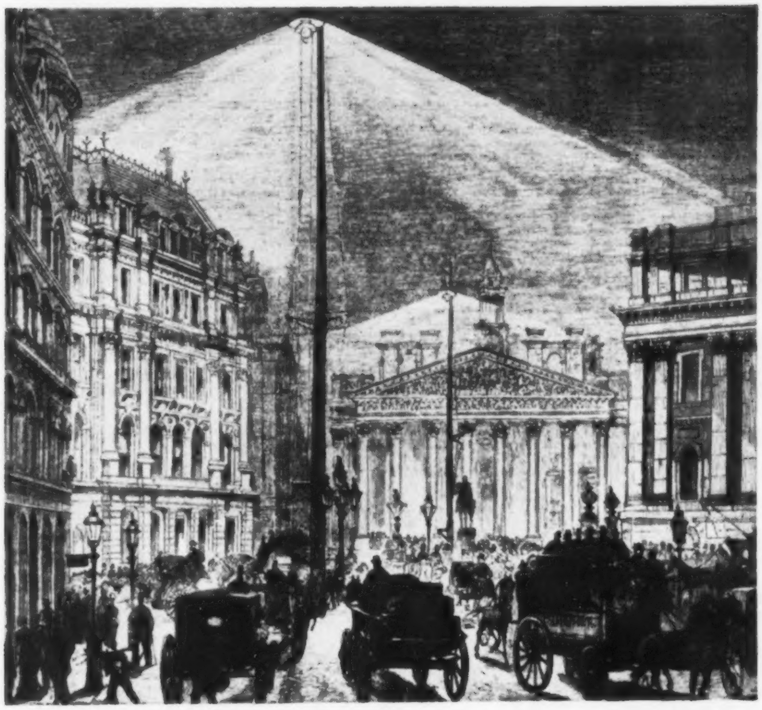
The efforts of the society in bringing home to architects the importance of a knowledge of lighting have been mentioned several times (see pp. 50 and 54). As a complementary activity, in 1956 an architect-member of the IES gave a series of lectures on architecture to members of the society and a second course by four architects was arranged in 1957. In September of that year the society co-operated with the York Institute for Architectural Studies in organising a seminar on lighting for teachers of architecture.

A still more recent educational activity of the society was a one-day conference on industrial lighting, held at the Northampton College of Advanced Technology in April, 1958, and attended by some 200 works managers and works engineers.

Since 1937 the various educational activities of the society have been co-ordinated and fostered by a special committee of the council—the Education Committee. The need for such activities increases rather than diminishes as the society grows and the technology of lighting develops. Most of the major engineering institutions now have specialist education officers working under an education committee. At no far distant date the IES may well consider whether it would be expedient to follow their example—not only in the interests of its student members but also to ensure that the future development of lighting engineering in the U.K. is securely based on sound technical and scientific foundations.

Lighting demonstrations to school children. On the right, E. B. Sawyer, President 1957-58





1880

In 1880 the principal streets of the City of London—King William Street, Poultry, and Cheapside, including the Guildhall and the Royal Exchange —were lighted by 3,000 candle power arc lamps on 75 ft. steel poles. Each lamp was fed from a separate steam-driven 'dynamo electric machine'. This was one of the earliest examples of the use of electricity for public lighting and one of the first lighting installations carried out by Siemens Brothers.

SIEMENS EDISWAN

PUBLIC LIGHTING SYSTEMS

1959

Today, a surprising amount of the familiar City scene remains unchanged, although the arc lamps no longer swing above the traffic. In their place you see clean, unobtrusive fluorescent lighting fittings, specially styled to conform to the character of their surroundings. The "City Lanterns," produced in the modern Siemens Ediswan factories, are backed by lighting experience which stems directly from the work of the original Siemens Brothers. They are but one example of a range of successful public lighting systems designed and developed by Siemens Ediswan to meet the varying needs of authorities at home and in many countries overseas. Siemens Ediswan will be happy to forward literature on their industrial, commercial and public lighting fittings to interested engineers.

The SIEMENS EDISWAN City Lantern

Originally developed for the City of London and now widely specified by other public authorities. Available in pole and wall mounting types.

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An A.E.I. Company

Lamps and Lighting Division, 38/39 Upper Thames Street, London E.C.4 and branches. Telephone: CENtral 2332

CRC 11/46

Correspondence

Equivalent Reflectance

Dear Sir,—Since the discussion on Mr. Waldram's paper on page 177, Trans I.E.S. No. 3 (1958), I have been informed of a very accurate formula due to Mr. Jean Dourgnon for the calculation of equivalent reflectance. It does not suffer from the disadvantage of the earlier approximations which only apply over limited reflectance ranges, so should be of value and interest to readers.

It is:—

$$\rho_e = \frac{A\rho}{A_c - A_{c\rho} + A_\rho}$$

where

ρ_e = equivalent reflectance
ρ = actual reflectance
A_c = total area of cavity walls
A = area of cavity opening

The proof is simple:—

Flux absorbed = incident flux times $(1-\rho_e)$
= cavity wall flux times $(1-\rho)$

Luminance = cavity wall flux times $(1/A_c)$
= incident flux times (ρ_e/A)

Note that cavity walls flux is greater than incident flux due to interreflections.

Glasgow. R. Croft.

Illumination Levels

Dear Sir,—If Mr. Penny will take another random re-view of the I.E.S. Code perchance his gaze will encounter Scale C—which goes to 1,000 lm/ft.^{2}. Not so well out of date after all, eh? Your long-silent correspondent,

London. "Dimmerwit."

Situations

Vacant

A vacancy occurs for interesting post with opportunities for training Lighting Engineer. Please write stating experience, qualifications and salary required to Chief Lighting Engineer, "A" Department, FALKS, 91 Farringdon Road, E.C.1.

Atlas Lighting Limited
require
Technicians

for interesting work in Lamp Development Laboratory situated in North London. Previous experience an advantage. Applicants aged 20 to 30 years should write giving full details to WJM/LED, Atlas Lighting Limited, Angel Factory colony, Angel Road, Edmonton, N.18.

FORTHCOMING EVENTS

LONDON

February 16th

Trotter-Paterson Memorial Lecture by Professor Sir Solly Zuckerman, F.R.S. (At the Royal Institution, Albemarle Street, W.1.) 6 p.m.

February 9th

Golden Jubilee Commemoration Dinner, Criterion Restaurant, W.1.

CENTRES AND GROUPS

February 2nd

Stoke-on-Trent.—"Lighting for Photography." (At the North Stafford Hotel, Stoke-on-Trent.) 6 p.m.

February 3rd

Newcastle-upon-Tyne.—Swan Memorial Lecture by J. N. Aldington. (At the Lecture Theatre, Literary and Philosophical Society, Westgate Road, Newcastle-upon-Tyne.)

February 4th

Edinburgh.—"Artificial Lighting for the Paper Making Industry," by L. C. Rettig. (At the Y.M.C.A., 14, South St. Andrew Street, Edinburgh.) 6.30 p.m.

February 6th

Swansea.—Jubilee Ball.

February 9th

All Centres.—Golden Jubilee functions linked to dinner in London.

February 12th

Manchester.—"An Analytical Approach to Industrial Lighting," by W. Imrie-Smith. (At the North Western Electricity Board, Town Hall Extension, Manchester.) 6 p.m.

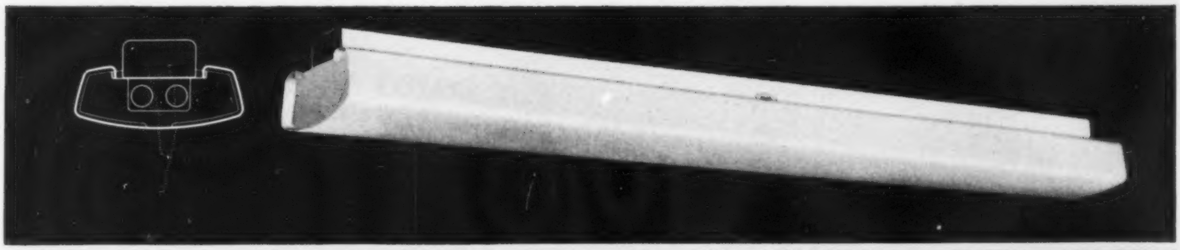
February 16th

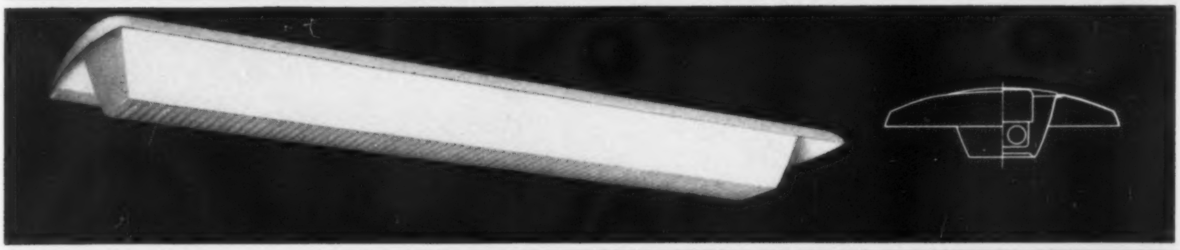
Bath and Bristol.—"New Light Sources," by F. Jackson. Joint Meeting with E.C.A. (At the Showroom, South Western Electricity Board, Plymouth.)

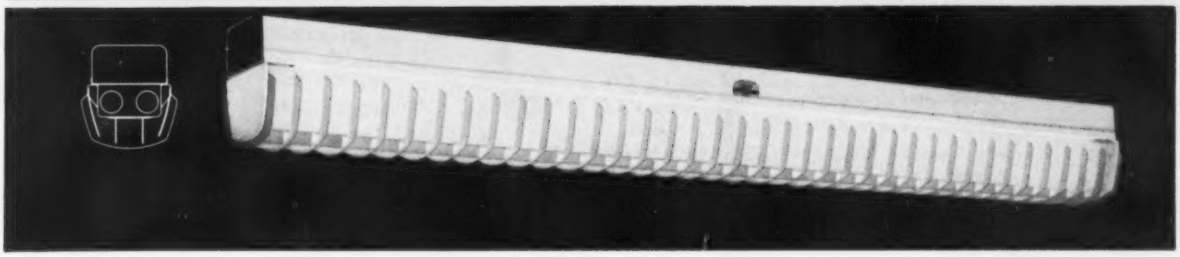
Dr. J. N. Aldington, a past president of the IES, is to broadcast in Science Survey (BBC Network Three) at 6.45 p.m. on Friday, February 6th on the present state of the art of lighting and future possibilities. A recording of the broadcast can be heard on the Home Service at 9.10 a.m. the following day.

ILLUMINATING ENGINEERING SOCIETY 1909-1959

3 new atlas atlantic fittings







1 *SERIES 1B. Opal acrylic diffuser of soft diamond texture, with interchangeable coloured end plates.*

2 *SERIES 1C. One-piece acrylic moulded diffuser and canopy, underside ribbed for contrast.*

3 *SERIES 1E. Attractive "Twinluve" diffuser, with pearl finish polystyrene sections.*

More scope for design, faster installation, simpler maintenance . . . . that's the ATLAS ATLANTIC range of pre-assembled fluorescent fittings. There are now some 450 different styles and sizes from which to choose, and all with the same unique chassis design. This standardisation in basic construction, together with the wide variety of fittings, results in lower cost all round, and extends the applications of this one range to cover all industrial, commercial and general purpose lighting. Thus a "family" theme can be maintained throughout the largest installation, and the fittings and attachments quickly interchanged to conform with any functional alterations of the premises.

atlas leads in lighting

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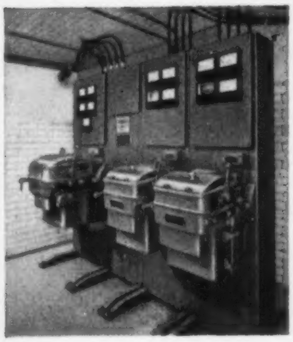
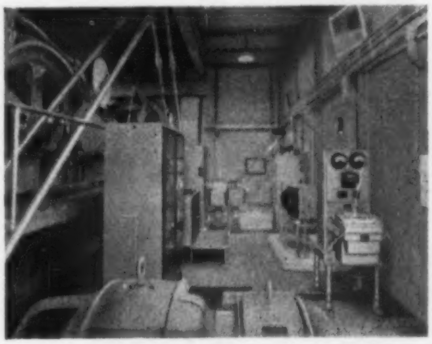
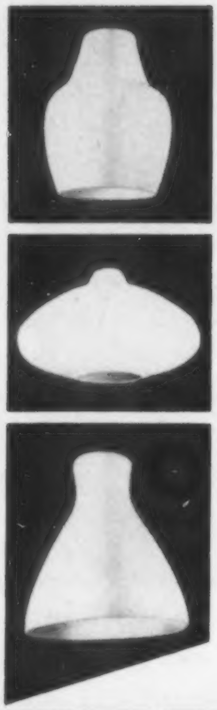




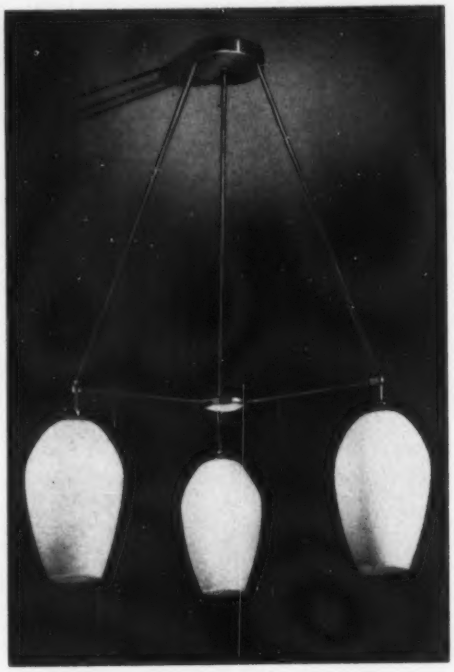


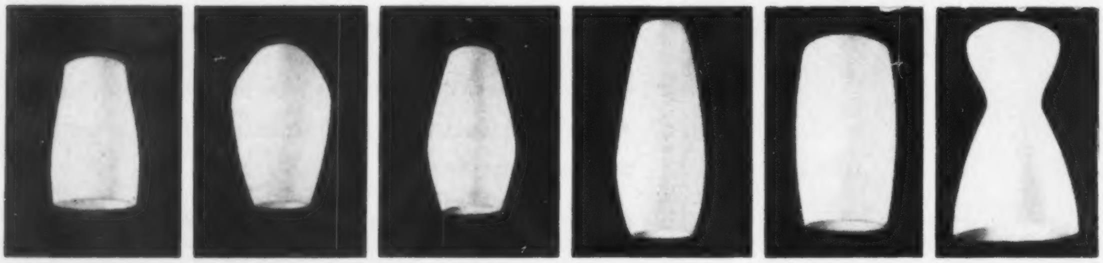
Satina

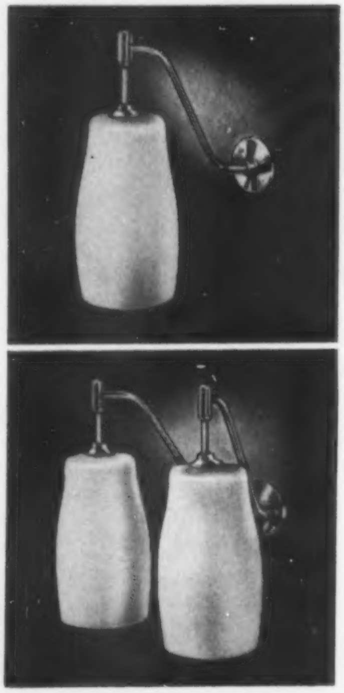
A range of lighting pendants with wall brackets to match, available with satin etched, white, opal or pink glass.

British Design

British Manufacture







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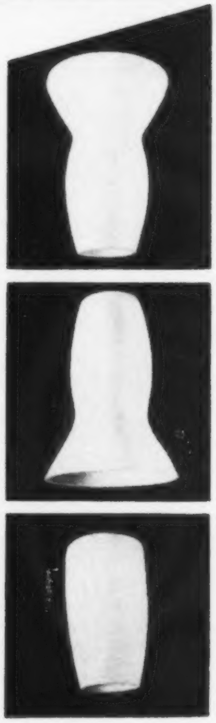
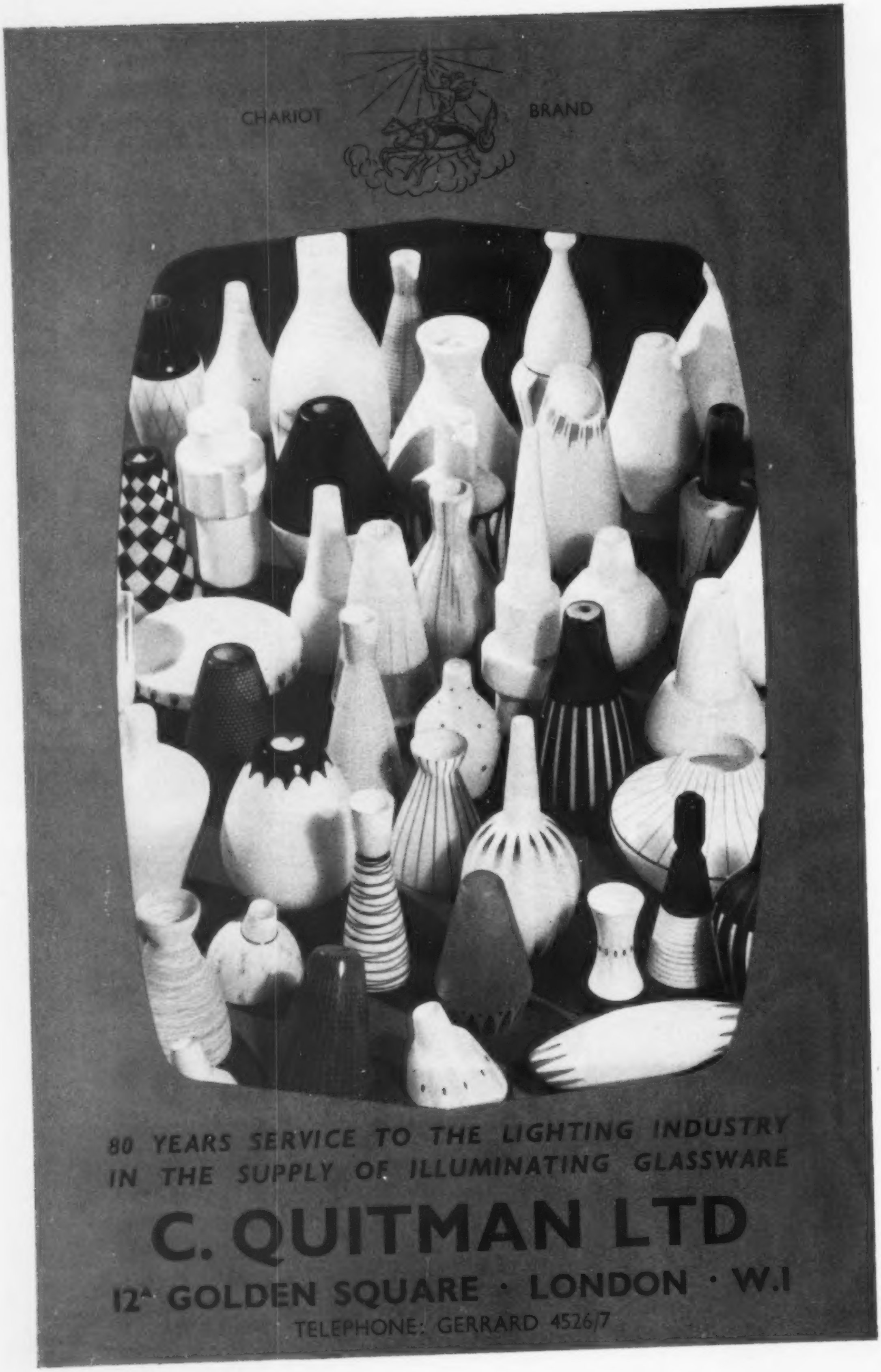


Please send for Catalogue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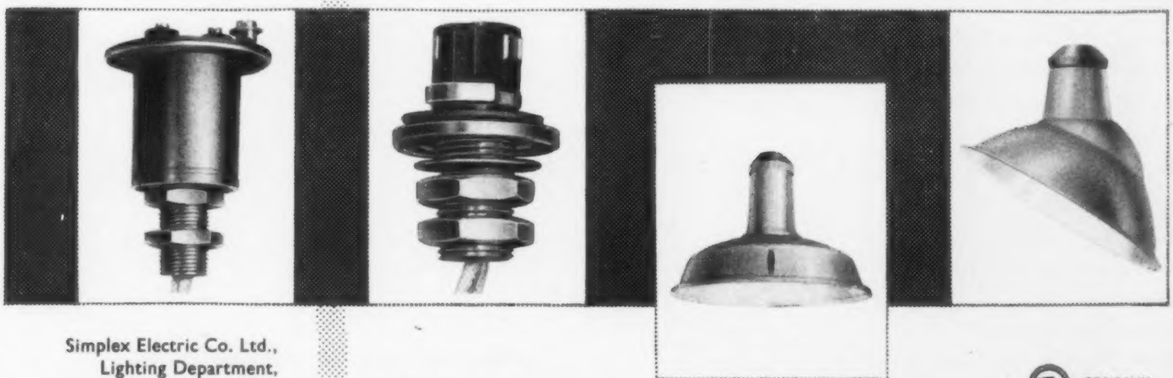

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